Role of Modified Biophysical Profile in High Risk Pregnancy in Predicting Fetal Outcome

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ABSTRACT

Background: High risk pregnant women have increased risk of maternal and neonatal morbidity and mortality. Antepartum surveillance is important and should be effective in such conditions. Modified biophysical profile is the method of antepartum surveillance which comprises of cardiotocography and amniotic fluid index.

Methods: A cross-sectional study was carried out in Paropakar Maternity and Women's Hospital from February 2019 to January 2020 to determine the effectiveness of modified biophysical profile. Cardiotocography was interpreted as reactive, equivocal and non-reactive. AFI was considered normal if it was 5 to 24 cm. In the study 172 high risk cases at term and not in labor were included. Each case was subjected to cardiotocography then amniotic fluid index was obtained using real time sonography where it was measured from all four quadrants. Modified biophysical results were obtained and then were divided into 2 arms as normal modified biophysical profile and abnormal modified biophysical profile then analysis was done.

Results: Of 172 cases, there were 97 (56.4%) cases in normal modified biophysical profile and remaining 75 (43.6%) in abnormal modified biophysical profile group. The rate of cesarean section increased when there was abnormal modified biophysical profile. Neonatal resuscitation and admission was increased in abnormal modified biophysical profile.

Conclusions: Normal modified biophysical profile in high risk pregnancy had more cases of vaginal delivery and less adverse fetal outcome like low APGAR score, neonatal resuscitation and neonatal intensive care admission.

Keywords: Amniotic fluid index; cardiotocography; fetal surveillance; modified biophysical profile

INTRODUCTION

High risk pregnancy is complicated by factor that adversely affects the pregnancy outcome. The risk factors are extremes of age, parity, short interpregnancy interval, history of chronic diseases. The mother or fetus or both is at increased risk of morbidity and mortality.[1] In Nepal, 50% pregnancies are high risk where 28.9% belongs to single high risk category and 22.9% belongs to multiple high risk category.[2] Most obstetric complications can be prevented if high risk pregnancy can be identified and taken care of.[2] Antepartum fetal surveillance can prevent the risk of unnecessary interventions, attendant risks and costs.[3,4] Modified biophysical profile (MBPP) is the modification of biophysical profile which is less time consuming than complete biophysical profile. It is the method of antepartum surveillance which comprises of cardiotocography (CTG) and amniotic fluid index (AFI) where cardiotocography accounts for short term status of fetus and amniotic fluid index accounts for long term condition of fetus.[5-7]

METHODS

The study was a cross sectional study, conducted at Paropakar Maternity and Women's Hospital (PMWH), Thapathali, Kathmandu for a period of one year from Feb 2019 to Jan 2020. It included 172 high risk obstetric patients after 37 completed weeks, singleton and not in labor. The cases included were postdated pregnancy, pre-labor rupture of membrane (PROM), intrauterine growth restriction (IUGR), gestational hypertension (GHTN), Pre-eclampsia, Rh-negative pregnancy, hyperthyroidism, hypothyroidism, bad obstetric history (BOH), oligohydramnios and polyhydramnios. Any emergent condition like eclampsia, acute hypoxic states like abruption of placenta, cord prolapse, uterine scar rupture, abnormal lie and presentation

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requiring immediate caesarean section, cephalo-pelvic disproportion, fetus with congenital anomaly, multifetal gestation, pregnant women with essential hypertension, overt diabetes mellitus, cardiac disease, seizure disorders requiring multidisciplinary approach were excluded from study. The prevalence of high-risk pregnant women at 37 completed weeks not in labour in PMWH was 12.8% in the year 2018. A sample size of 172 was obtained using a formula.[7]

After a detailed history and clinical examination, a 20-minute cardiotocography reading was done. CTG results were interpreted as reactive, equivocal and non-reactive as per Royal College of Obstetricians and Gynecologists guidelines.[8] Then AFI was measured by using real time sonography by summing amniotic fluid volume in all four quadrants and was interpreted as normal if AFI was 5-24 cm and abnormal when AFI was less than 5 or more than 25 cm.[9] Any loop of cord while measuring AFI was discarded. Based on the finding of CTG and AFI, they were further divided into 4 categories- reactive CTG and normal AFI, non-reactive CTG and normal AFI, reactive CTG and abnormal AFI and non-reactive CTG and abnormal AFI. They were then divided into 2 arms as normal MBPP and abnormal MBPP. Reactive CTG with normal AFI were kept in normal MBPP and remaining 3 categories were kept in abnormal MBPP arm. If CTG was non- reactive and AFI less than 5 were immediately considered for delivery. Patients with normal tests results were allowed to begin labor spontaneously except when delivery was indicated for maternal and obstetric complications. All the patients were closely watched during labor.

Mode of delivery and fetal outcome was noted in terms of meconium stained liquor, Apgar score at 5 min, need for neonatal resuscitation and neonatal intensive care unit (NICU) admission and neonatal death. Ethical approval was obtained from Institutional Review Committee of National Academy of Medical Sciences. Informed consent was obtained from the pregnant women included in the study

The data entry was done in master chart and analyzed using SPSS version 20.0. Chi square test was applied to see the relation between the variables and p values were obtained to determine the significance of the relationship.

RESULTS

A total of 172 cases were included in the study. Out of 172 cases 48 (27.9%) were postdated followed by gestational hypertension 33 (19.2%), pre-labour rupture

of membrane 29 (16.9%) hypothyroidism 17 (9.9%), gestational diabetes mellitus 8 (4.7%), reduced fetal movement 8 (4.7%), pre-eclampsia 7 (4.1%), Rh negative status 7 (4.1%), oligohydramnios 6 (3.5%), intrauterine growth restriction 4 (2.3%), hyperthyroidism 3 (1.7%), remaining (1%) bad obstetric history.

The most common age group in the study was 19-25 years 94 (54.7%). Most of them were primigravida 110 (64%). Most of the patients belonged to gestational age of 40 to 42 weeks i.e. 95 (55%). The surveillance of patients in study group was initiated from 37 completed weeks where 47.67% belonged to 37-40 weeks of gestation and remaining 52.32 % belonged to 40+ to 42 weeks of gestation.

| Table 1. Modified biophysical profile (MBPP) result in study population (n=172).		
CTG		
	Normal	Abnormal
AFI		
Reactive	96 (56.4%)	14 (8.1%)
Non-reactive	41 (23.8%)	20 (11.6%)

Most of the cases belonged to reactive CTG and normal AFI category i.e. 97 (56.4%), there were 41 (23.8%) cases in non-reactive CTG and normal AFI group, 14 (8.1%) in reactive CTG and abnormal AFI group and 20 (11.6%) were present in non-reactive CTG and abnormal AFI group (Table 1).

Table 2. Mode of delivery in relation to MBPP results.			
Mode of delivery	Vaginal delivery	Caesarean section	P value
MBPP			
Normal	70	27	0.000
Abnormal	19	56	

Most of the cases (70/97, 72%) in normal MBPP group had vaginal delivery and most of the cases in abnormal MBPP had caesarean section (56/75, 76%). (Table 2) Most of the cases in study group had clear liquor. (107/172, 62%).

In normal MBPP group, (58/97, 59.7%) had clear liquor and remaining (39/97, 40%) had moderate to thick meconium stained liquor. In abnormal MBPP group (40/75, 53.3%) had clear liquor and remaining (35/75, 46.7%) had moderate to thick meconium stained (p value-0.012) .
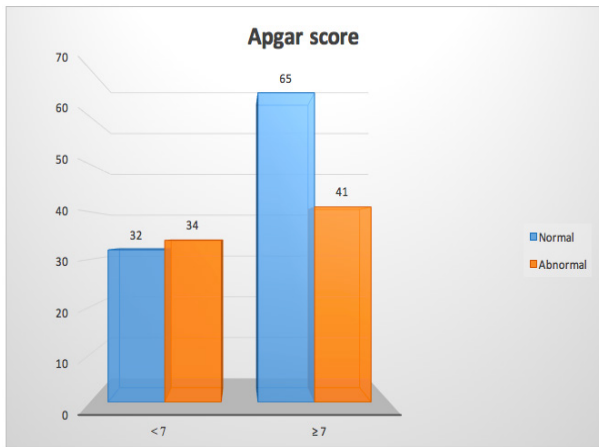
Figure 1. Apgar score at 5 minutes in relation to MBPP results.

In study population, normal MBPP results had score ≥ 7 in most of the cases (65/97, 67%) (Figure 1).

Most of the cases in normal MBPP group (63/97, 64.9%) did not require neonatal resuscitation. However in abnormal MBPP (41/75, 54.6%) did not require resuscitation.

Table 3. NICU admission required in relation to MBPP results.

NICU admission	Yes	No	P value
MBPP results			
Normal	33	64	0.088
Abnormal	34	41	

Most of the cases (64/97, 65.9%) in normal MBPP arm did not require NICU admission. However, in abnormal MBPP arm (34/75, 45.3%) required neonatal admission (Table 3).

In normal MBPP results no mortality was seen. There were 3 mortalities in abnormal MBPP results of which 2 cases were in abnormal CTG with normal AFI category and 1 case in abnormal CTG with abnormal AFI category.

DISCUSSION

One of the major goals of antepartum surveillance is early detection of fetal compromise and timely intervention to decrease the perinatal morbidity and mortality. In the present study, modified biophysical was used as primary method for antepartum surveillance. In the study 172 cases were enrolled with high risk factors in each of them. The major risk factors in this study was postdated pregnancy (27.9%), followed by gestational hypertension (19%) and PROM (16%). In the study done by Miller[10] high risk factors like postdated, diabetes mellitus, decreased fetal movement, suspected intrauterine growth restriction, hypertension, and history of stillbirth were included. Among then 41% cases were postdated, 21% had diabetes mellitus, 14% decreased fetal movement, and 8% had hypertension. In the study by Nageotte[11] 44% were postdated followed by IUGR 23% then pregnancy induced hypertension (11.8%). In the study of Borade and Sharma[12], 33% were postdated followed by PIH (17%) then IUGR (7%). In the study by Maurya [13] most common risk factor admitted was PIH accounting for 21% followed by post-dated 10%.

In this study out of 172 cases, there were 97 (56.4%) cases in normal MBPP group and remaining 75 (43.6%) cases in abnormal MBPP group. In the study by Nageotte[11] 52.9% had normal MBPP and remaining 47.1% had abnormal modified biophysical results. Similar result was seen in the study by Agrawal[14] where abnormal MBPP was present in 49.6%.

In this study, the incidence of vaginal delivery and LSCS were 72.2% and 27.8% respectively. However, in abnormal MBPP, the incidence of vaginal delivery and cesarean section rate was 10% and 90% respectively. In the study by Nageotte[11] the rate of cesarean section was 15.1% when the abnormal modified biophysical and it was 3.8% when there was normal MBPP. In the study by Miller[10], Eden[15] the incidence of cesarean section rate was 36% and 15.8% respectively with abnormal MBPP and 13% and 4.1% respectively with normal MBPP. This shows the similar results that the rate of cesarean section increases with abnormal MBPP.

In the present study, when the color of liquor was compared following delivery with respect to MBPP results, clear liquor was present in 68% and remaining 32% had moderate to thick meconium stained liquor. Normal MBPP results had 59.7% clear liquor and remaining 40.3% had moderate to thick meconium stained liquor. In abnormal MBPP results, 53.3% had clear liquor and remaining 46.7% had moderate to thick meconium stained liquor. In the study of Agrawal[14], Eden[15] 3% and 11% had meconium stained liquor in normal MBPP results, this is much less than our finding.

In the study done by Eden[15], in abnormal MBPP 41% had moderate to thick meconium stained liquor, which is similar to our finding. In contrast, the study by Agrawal[14] and Patil[16], 28% and 15% had moderate to thick meconium stained liquor respectively.

Fetal distress was considered to be present when Apgar score at 5 minutes after birth was less than (<7). In the present study, out of 172 deliveries, 38.3% had Apgar score less than 7 and remaining 61.6% had Apgar ≥ 7. Most of the cases with normal MBPP had Apgar ≥ 7 (67%) and remaining 33% had Apgar score <7. Similar, results

were seen in the study by Maurya,[13] Agrawal[14] where normal MBPP had 70.6% cases and 59.7% respectively. of Apgar >7. In this study, 54.6% cases had Apgar score ≥7 in abnormal MBPP group. In the study by Borade,[12] 84.5% cases had Apgar score ≥ 7, which is much higher than this study. However, the results were different when compared to study by Nageotte[11] and Eden[15], where the rate was 1% and 2% respectively in abnormal MBPP group.

Assessment of the fetal outcome was done in terms of neonatal resuscitation needed at the time of birth and NICU admission in relation to MBPP results. In the present study, 40% of babies required resuscitation and 39% were admitted in NICU. In this study 35% cases required neonatal resuscitation and admission in normal MBPP group. Similarly, in the study by Borade[12] and Agrawal[14] 24.2% and 7.9% required neonatal resuscitation and admission. In this study, 45.3% required neonatal resuscitation and admission in abnormal MBPP results. Similar to this study, 43.9% required neonatal resuscitation in study by Agrawal.[14] In contrast to this study by Borade[12] 70.5% required resuscitation which is much greater than our study.

Out of 33 cases admitted in NICU in normal MBPP group, 18 cases were discharged after 24 hours observation, remaining 15 cases were discharged after 14 days. Out of 34 cases admitted in abnormal MBPP group, 12 cases were discharged in 14 days and 3 cases had neonatal mortality. 2 cases died within 48 hours of life due to neonatal sepsis and respiratory distress syndrome and 1 case died within 2 hours of life due to meconium aspiration syndrome. In this study the neonatal mortality rate is 17% which is much higher than the study by Patil[16], Agrawal[14] Eden[15], where the mortality rate was 1.2%, 8.1% and 5% respectively.

CONCLUSIONS

Normal modified biophysical results in high risk pregnancy had more cases of vaginal delivery and less adverse fetal outcomes like low Apgar score, need for neonatal resuscitation and neonatal intensive care admission. Rate of caesarean section, fetal morbidity and mortality increased in abnormal modified biophysical profile results.

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