Relationship between Amniotic Fluid Index and Perinatal Outcome

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Aims: This study was done to evaluate the predictive value of low amniotic fluid index (AFI) of < 5 cm for adverse perinatal outcome in term of caesarean section for fetal distress, birth weight, meconium stained liquor and APGAR scores.

Methods: This was a prospective study of 200 antenatal women booked at Nepal Medical College Teaching Hospital during the year 2013-2014 with gestational age between 34 and 41 weeks. Patients history and clinical examination were recorded and AFI was measured and the perinatal outcome was compared between two groups i.e AFI <5 cm and >5 cm.

Results: The caesarean section (C/S) rate for fetal distress and low birth weight babies (<2.5 kg) was higher in patients with low AFI (p=0.048, 0.001 respectively). There was no significant difference in meconium staining, APGAR score at 5 minutes between the two groups (p=0.881, 0.884 respectively).

Conclusions: Caesarean section for fetal distress and low birth weight babies was significantly associated with low amniotic fluid index. There was no significant difference in meconium staining liquor, APGAR score at 5 minutes between the two groups.

Keywords: amniotic fluid index; birth weight; caesarean delivery; meconium-stained liquor.

INTRODUCTION

Amniotic fluid provides a protective milieu for the growing fetus cushioning it against injury.[1,2] Although the clinicians were readily able to recognize the development of acute and excess of amniotic fluid in their patients, it is often difficult to recognize low amniotic fluid volume (AFV). Sonography is well suited to this task on a large scale and can be used frequently for repeat AFV determination. Phelan et al[3] and subsequently Rutherford et al[4] and Moore et al[5] developed a semi-quantitative sonographic assessment of the AFV that has come to be known as the amniotic fluid index (AFI). This measurement is based on the division of the gravid uterus into four quadrants using the external maternal landmarks of the umbilicus and linea nigra. These four measurements are added together and the sum is referred to as AFI. Most examiners[6] use an AFI of 5 cm as the threshold for oligohydramnios. Regardless of the causes many investigators have noted increased perinatal morbidity and mortality in the presence of oligohydramnios.[1,2,6] In our study, amniotic fluid quantification was done by four quadrant technique as described by Phelan et al[3] to determine AFI and we sought to determine if an antepartum AFI of 5 cm or less is a predictor of adverse perinatal outcome in terms of meconium stained liquor, caesarean section rate for fetal distress, birth weight and low APGAR scores.

METHODS

This was a prospective study carried out at Nepal Medical College Teaching Hospital, Kathmandu. The participants included 200 booked women with gestational age between 34 and 41 weeks admitted for delivery over a two-year period from January 2013 to December 2014. We included all eligible women for the study who attended our hospital during the study period. Records were maintained of meconium stained liquor, mode of delivery, birth weight and APGAR score at 1 and 5 minutes. Demographic profile, obstetric characteristics and perinatal outcome are also noted (Table 1-3). Inclusion criteria were women with singleton, non-anomalous fetus with intact

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membrane at the time of antepartum testing. Women with premature rupture of membranes, with known fetal or chromosomal anomalies, gestational diabetes, Rhesus incompatibility, placental anomalies and multiple pregnancies were excluded from the study. On admission, a detail history was taken and clinical examination was performed and the gestational age was assessed. Amniotic fluid index was determined using the Phelan's technique[3] at admission and whenever seemed necessary after informed verbal consent. Non-stress Test (NST) was performed for all patients. Women were divided into two groups based on their AFI (within 48 hours of admission): group 1- AFI of ≤ 5 cm; group 2 AFI of >5 cm. Statistics was analyzed using Chi square (X^2) test and p value less than 0.05 was taken as significant. Informed consent was obtained from all the women. Approval from the Intitutional Review Committee of Nepal Medical College was also taken.

RESULTS

Out of 200 women the mean maternal age was 27.04 years in group 1 and 27.95 years in group 2. Gestational age was less than 37 weeks in 14/25 (46%) in group 1 as compared to 60/175 (34.3%) in group 2. Maternal weight gain during pregnancy was less than 10 kgs in 9 (36%) in group 1 as compared to 15 (8.6%) in group 2. Eighteen (72%) patients were induced in group 1 and 89 (50.9%) in group 2. Obstetrics and perinatal outcomes were studied in both the groups (Table 1).

Table 1. Maternal demographic and obstetric characterstics (n=200).

	AFI ≤ 5 (n=25)	AFI>5 (n=175)	p value
Maternal age (mean)	27.04 yrs	27.95 yrs	0.34
Nulliparity	17 (68%)	103 (58.9%)	0.22
Gestational age <37 weeks at delivery	14 (56%)	60 (34.3%)	0.35
Weight gain <=10 kg	9 (36%)	15 (8.6%)	0.001
Induction of labour	18 (72%)	89 (50.9%)	0.043

Four (16%) women in group 1 and 26(14.9%) women in group 2 had meconium stained liquor. The difference was not significant (p=0.881). Caesarean section was performed in 14(56%) women in group1 and 62 (35.4%) in group 2 (p=0.047). Caesarean section for fetal distress was higher in women with oligohydramnios (57.1%) as compared to women with AFI of >5 cm (38.7%){p=0.048}. Birth weight <2.5 kgs was found in 14 (56%) patients in group 1 and 38 (21.7%) in group 2.In group 1 the APGAR score at 1 minute was of <7 in 9 women (36%) and 19 (10.9%) in group 2 (p=0.001). APGAR score of <7 at 5 minutes was noted in 1(4%) in group 1 and 6 (3.4%) women in group 2 (p=0.884) and the difference was not statistically significant (Table 2).

Table 2. Obstetric and perinatal outcome (n=200).

	AFI ≤ 5 (n=25)	AFI>5 (n=175)	p value
Meconium stained liquor	4 (16%)	26 (14.9%)	0.881
Cesarean delivery	14 (56%)	62 (35.4%)	0.047
Cesarean for non-reassuring fetal status	8 (57.1%)	24 (38.7%)	0.048
Birth weight	<2.5 kg	38 (21.7%)	0.001
Apgar score	14 (56%)		
1 min<7	9 (36%)	19 (10.9%)	0.001
5 min<7	1(4%)	6 (3.4%)	0.884

In group 1, 17 (70%) had normal and 5 (20%) had pathological cardiotocography (CTG). In group 2 out of 175 patients, 146 (83.4%) had normal CTG and 9 (5%) had pathological CTG. The rate of pathological CTG in group 1 was statistically significant (Figure 1).

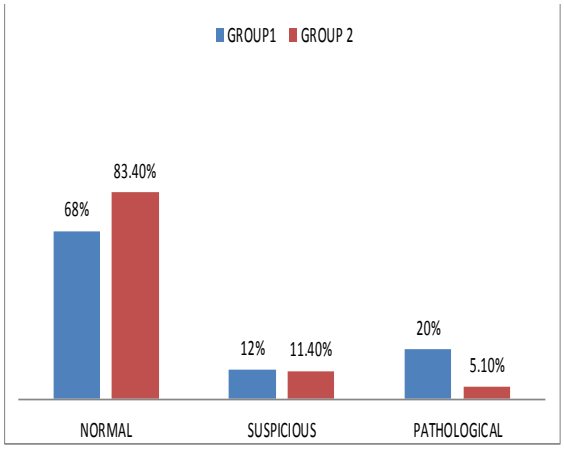

Figure 1. Intrapartum CTG.

Non-reactive NST was present in a significant number of patients in group 1, 8 (32%) compared to 17 (9.7%) in group 2 {p=0.0002}. Twenty-three babies (92%) were admitted to the neonatal intensive care unit (NICU) in group 1. In group 2, 125 (71.4%) babies were admitted to the NICU. Duration of NICU stay of more than two days was found in 9 (36%) in group 1 and 42 (24%) in group 2 (p=0.198). Therefore the two groups were comparable with regard to NICU stay (Table 3).

Table 3. Secondary outcome measures (n=200).

	AFI ≤ 5 (n=25)	AFI>5 (n=175)	p value
Non-Reactive NST	8 (32%)	17 (9.7%)	0.002
Admission to NICU	23 (92%)	125 (71.4%)	0.028
NICU stay > 2 days	9 (36%)	42 (24%)	0.198

DISCUSSION

In the present study, meconium stained liquor was present in 4(16%) of the patients in group 1 and 26 (14.9%) in group 2, the difference was not significant (p=0.881). The caesarean section rate was higher in group 1, 56% as compared to 35.4% in group 2,the difference was statistically significant (p=0.047). Caesarean section for fetal distress was also higher in patients with oligohydramnios as compared to group with normal AFI (57.4 vs 38.7%). A study conducted by Baron et al[7] showed that the meconium stained liquor occurred significantly less often in the oligohydramnios group as compared to normal AFI group. A study by Voxman et al[8] concluded that there were no difference between the groups with regard to meconium stained liquor, which was comparable to our study. Chauhan et al[9] in their meta analysis found that intrapartum AFI of ≤ 5 cm was associated with increased risk of Caesarean section for fetal distress which was similar to our study. Rutherford et al [10] found an inverse relationship between amniotic fluid index and caesarean section for fetal distress. In the current study, birth weight of <2.5 kg was found in 14 (56%) in group 1 vs 38 (21.7%) in group 2 and the difference was statistically significant (p=0.001). Locatelli et al[11] reported that in an uncomplicated term pregnancy with hydramnios the presence of AFI of <5cm independently increased the risk for small for gestational age babies Morris et al[12] found that 60 % of babies were low birth weight in the group with the AFI of <5 cm indicating that oligohydramnios had an association with growth restriction. A study by Rutherford et al[10] showed that when the AFI was < 5 cm (36%) pregnancies resulted in infants with intrauterine growth restriction (IUGR). In the present study, the 1 min APGAR score was <7 in 9 (36%) in group 1, whereas only 10.9% babies in group 2 had 1 min APGAR score <7 and this difference was statistically significant (p=0.001). However the 5 min APGAR score <7 was almost equal in both the groups (4 vs 3.4%). Chauhan et al[9] reported in the meta analysis that antepartum AFI of ≤ 5 cm was associated with a 5 min APGAR score of <7. A study by Driggers et al[13] reported at 5 min APGAR score of <7 in 3.8 % patients in an oligohydramnios group vs 4.6 % in a normal AFI group and concluded that there was no significnant difference. A study by Grubb et al [14] was found that 1 min APGAR score of <7 in 84% of patients with AFI of <5 as compared to 14 % in normal AFI groups which was highly significant (p=0.01). In the same study, 5 min score of <7 was seen in 13% patients with AFI of ≤ 5 cm vs 5% in normal AFI group.

CONCLUSIONS

In this study antepartum oligohydramnios (AFI≤5) was associated with increased caesarean section delivery particularly for fetal distress. A significant positive correlation was found between oligohydramnios and low birth weight babies. However there was no difference in perinatal outcome in terms of meconium staining liquor and 5 minute APGAR score between the two groups. When the secondary outcomes were measured, significant correlation was found in term of non-reactive NST and admission to NICU. Therefore, patients with severe oligohydramnios with AFI of ≤ 5 cm should undergo strict antepartum and intrapartum management and/or timely caesarean caesarean to improve their perinatal outcome.

DISCLOSURE

The authors report no conflicts of interest in this work.

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