

## Perinatal outcome of term pregnancies with borderline amniotic fluid index at Nepal Medical College and Teaching Hospital

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### ABSTRACT

Estimation of amniotic fluid volume is an integral part of antenatal fetal surveillance. Oligohydramnios (amniotic fluid index < 5 cm) is considered as an indicator of poor perinatal outcome. But very few studies have been conducted to observe the perinatal outcome of women with borderline amniotic fluid index (5.1 cm to 8 cm). Whether borderline amniotic fluid index is also associated with adverse perinatal outcome and should be categorized along with the group of oligohydramnios and managed similarly is uncertain. The objective of this study was to determine whether borderline amniotic fluid index detected during antenatal period is associated with adverse perinatal outcome. This case control study was conducted at Nepal Medical College and Teaching Hospital from April 2013 to March 2014, where 165 cases of term singleton pregnancy, with cephalic presentation, in labor and with borderline amniotic fluid index (5.1 cm to 8 cm) detected by ultrasonography done within the past seven days were recruited for the study. The perinatal outcomes were compared with a control group of 165 similar cases but with normal amniotic fluid index (8.1 cm to 24 cm). There was significantly increased incidence of caesarean delivery, meconium stained liquor, Apgar score < 7 at 5 minutes of life and neonatal intensive care unit (NICU) admissions in cases with borderline amniotic fluid index when compared with those with normal liquor volume. There was no significant increase in the incidence of intrauterine growth restriction. This study concluded that borderline amniotic fluid index is associated with adverse perinatal outcomes and requires increased antepartum surveillance and strict monitoring during labor to avoid neonatal complications.

**Keywords:** Amniotic fluid index, borderline amniotic fluid index, perinatal outcome.

### INTRODUCTION

Alterations in amniotic fluid volume, especially decreased amniotic fluid volume (oligohydramnios), have been considered as indicators of poor perinatal outcome. Amniotic fluid volume can be measured by different methods, commonly used being amniotic fluid index (AFI) evaluation using ultrasonography.<sup>1</sup>

American College of Obstetrics and Gynecology practice bulletin number 101 defined an AFI > 5 cm as consistent with normal amniotic fluid volume.<sup>2,3</sup> Several reports including one by Phelan *et al* who originally described the concept of AFI, have defined borderline oligohydramnios as a sonographic estimate of amniotic fluid volume, AFI of 5.1 cm to 8 cm.<sup>1</sup> Similarly Baron *et al* and Kwon *et al* also defined borderline oligohydramnios as amniotic fluid index of 5.1-8 cm.<sup>4,5</sup> However Gumus *et al* have described borderline oligohydramnios as AFI of 5.1 cm to 10 cm.<sup>6</sup>

In the meta analysis done by Magann EF *et al*, the incidence of borderline oligohydramnios in term pregnant women varied from 6% to 44%, overall incidence being 12%.<sup>7</sup> It is well established that oligohydramnios is associated with increased pregnancy related complications, congenital anomalies and perinatal morbidity and mortality. But very

few studies have been conducted to find out the maternal and perinatal outcomes in cases with borderline oligohydramnios. Whether borderline oligohydramnios is also associated with adverse pregnancy outcomes and should be categorized along with oligohydramnios and managed similarly is uncertain. Recent studies suggest that upto 16% of patients with low AFI (5-8 cm) will develop oligohydramnios within four days.<sup>8</sup> The objective of this study was to find out whether borderline oligohydramnios was associated with adverse perinatal outcomes or not.

### MATERIALS AND METHODS

A prospective comparative study was carried out in the Department of Obstetrics and Gynecology at Nepal Medical College and Teaching Hospital, a tertiary care hospital situated in a semi-urban area of Kathmandu, over a period of one year from 1<sup>st</sup> April 2013 to 31<sup>st</sup> March 2014. All the cases admitted in the labor ward with singleton term pregnancy having cephalic presentation with intact membrane and borderline oligohydramnios (AFI 5.1- 8 cm) detected by ultrasonography done within the past seven days were recruited for the study. Cases with medical disorders like pregnancy induced hypertension, gestational diabetes and heart disease were excluded from the study. If any congenital

anomalies were detected in the fetus, these women were also excluded from the study.

The same inclusion and exclusion criteria were applied to select pregnant women with normal liquor volume (AFI 8.1- 24cm) as controls. Both groups were matched for age, parity and gestational age. Thus for each case, there was one matched control. Informed verbal consent was taken for the study. The study was approved by the Research and Ethical Sub Committee of Nepal Medical College and Teaching Hospital.

After selection of the cases and controls, detailed history was taken and complete clinical examination done. They were followed up during labor and delivery and mode of delivery and perinatal outcomes were recorded in the research proforma. The adverse perinatal outcomes studied were intrapartum fetal distress, presence of meconium stained liquor during labor and delivery, Apgar score < 7 at 5 minutes, features of intrauterine growth restriction (IUGR), admission to NICU and neonatal death.

In this study, borderline amniotic fluid index or borderline oligohydramnios was defined as amniotic fluid index of 5.1 to 8cm. Intrapartum fetal distress was defined as the presence of fetal bradycardia or tachycardia and/or the presence of meconium in amniotic fluid. IUGR was defined as birth weight < 10<sup>th</sup> percentile for that gestational age as evidenced by birth weight less than 2.5kg at term delivery.

All relevant information was recorded appropriately and analyzed using SPSS version 17. Chi squared test was used to find any significant association between variables. A P-value of less than 0.05 was considered significant.

## RESULTS

The study was conducted over a period of one year from 1<sup>st</sup> April 2013 to 31<sup>st</sup> March 2014. A total of 2142 deliveries were conducted during the study period, out of which 165 cases had borderline oligohydramnios with AFI between 5.1 and 8 cm. Thus, the incidence of borderline oligohydramnios during the study period was 7.7%.

The gestational age and parity of women in the case and control groups are shown in Table 1 and Table 2. Mean maternal age of the cases was 24.9 years and that of control groups was 24 years. Both the groups were similar with respect to parity and gestational age.

**Table 1:** Gestational age and amniotic fluid volume

Gestational age	Borderline oligohydramnios	Normal amniotic fluid volume	P value
37-39 <sup>+</sup> weeks	81 (49.1%)	75 (45.4%)	0.3
40-41 weeks	78 (47.3%)	84 (51%)	0.3
> 41 weeks	6 (3.6%)	6 (3.6%)	NA
Total	165	165	

**Table 2:** Parity and amniotic fluid volume

Parity	Borderline oligohydramnios	Normal amniotic fluid volume	P value
Primi	95 (57.6%)	89 (53.9%)	0.4
G2	48 (29.1%)	48 (29.1%)	NA
G3	15 (9.1%)	19 (11.5%)	0.5
G4	7 (4.2%)	9 (5.5%)	0.2
Total	165	165	

Meconium stained amniotic fluid was observed in 51 (31%) cases with borderline oligohydramnios as compared to 25 (15%) cases with normal amniotic fluid. The incidence of meconium stained liquor was significantly higher in women with borderline liquor volume as shown in Table 3. Regarding mode of delivery, the rate of caesarean section was 33.3% among women with borderline oligohydramnios as compared to 17% among women with normal liquor. When indications for caesarean section were analyzed in the two groups, it was found that caesarean section for fetal distress was done in 32 women with borderline oligohydramnios and in only 8 women with normal liquor volume which was statistically significant (p value < 0.001).

**Table 3:** Mode of delivery and amniotic fluid volume

Type of delivery	Borderline oligohydramnios	Normal liquor volume	P value
Normal delivery	110	137	
Caesarean section	55 (33.3%)	28 (17%)	<0.001
For fetal distress	32	8	<0.001
For other causes	23	20	
Meconium stained liquor	51(31%)	25 (15%)	0.001

Table 4 shows perinatal outcomes including birth weight, APGAR score and NICU admission of both groups. Regarding perinatal outcomes, babies with APGAR score less than 7 at 5 minutes of birth were significantly higher among women with borderline oligohydramnios (8.4%) as compared to women with normal liquor (3%). Similarly NICU admission of babies was also higher among women with borderline oligohydramnios (18.1%) compared to women with normal liquor volume (7.8%). There was no significant difference between the two groups regarding the incidence of low birth weight babies. Two neonatal deaths were observed in women belonging to the borderline oligohydramnios group, the cause of deaths being meconium aspiration syndrome and birth asphyxia with hypoxic ischemic encephalopathy. There were no perinatal deaths observed among women in the normal liquor volume group.

**Table 4:** Perinatal outcome and amniotic fluid volume

	Borderline oligohydramnios	Normal liquor volume	P value
Birth weight < 2.5 kg	23 (14%)	12(7.2%)	0.07
Apgar score < 7 at 5 mins of birth	14 (8.4%)	5 (3%)	0.04
NICU admission	30 (18.18%)	13 (7.8%)	0.008
Neonatal death	2	0	

## DISCUSSION

Estimation of amniotic fluid volume is an integral part of antenatal fetal surveillance and it is a heavily weighted parameter. The amniotic fluid index (AFI) has been validated as an accurate and reproducible technique for assessment of amniotic fluid volume. AFI of 5 cm or less has been used to define oligohydramnios and is found to be associated with adverse perinatal outcomes. However, not all authors agree on this idea. Oligohydramnios, defined as AFI < 5 cm, could be considered a relatively low cut off point because it is at the 2.5<sup>th</sup> percentile and < 2SD below the mean for all gestations.<sup>9</sup> Phelan et al who originally described the concept of the AFI, have introduced the term borderline amniotic fluid volume when AFI was between 5.1 and 8 cm. In our study, the incidence of borderline oligohydramnios was found to be 7.7% which was comparable to studies by Kwon et al in 2006 (6%), Jeng et al in 1992(10%) and Ulker et al in 2011(10%).<sup>1,5,10,11</sup>

Meconium stained liquor is sometimes considered as an indicator of fetal distress and has its own dreadful complications in newborns. The incidence of meconium stained liquor in women with borderline oligohydramnios during labor and delivery was 31% in this study which was significantly higher than that seen among women with normal liquor volume. Similar to our study, Nazlima et al reported an incidence of 30.76%, Ghike et al reported an incidence of 26.98% and Conway et al reported an incidence of 24%. In all these studies, the presence of meconium stained liquor was significantly higher in women with borderline oligohydramnios compared to women with normal amniotic fluid volume.<sup>12,13,14</sup> However studies by Baron et al and Kwon et al did not observe any significant difference in the incidence of meconium staining of liquor between women with borderline oligohydramnios and women with normal amniotic fluid volume.<sup>4,5</sup>

In this study, the rate of caesarean section in women belonging to the borderline oligohydramnios group was 33.3%, which was significantly higher compared to 17% in women belonging to the normal amniotic fluid volume group. Similar to our study, Jamal et al reported the rate of caesarean section to be significantly higher among women with borderline

amniotic fluid volume (26.3%) compared to women with normal amniotic fluid volume (11.2%).<sup>15</sup> Patel et al reported the rate of caesarean section to be 40.82% and Blaraset al as 44% in women with borderline oligohydramnios which was similar to our study.<sup>16,17</sup> Both of them reported the rate to be higher than that in women with normal liquor volume. Nazlima et al reported the rate of caesarean section among women with borderline AFI as 62% which was quite high compared to our study. This could be because of the fact that elective caesarean section was done in 12% of the cases citing the presence of oligohydramnios.<sup>12</sup> Luo et al compared 196 women with borderline oligohydramnios with 200 women with normal liquor volume and found the rate of caesarean section to be higher in the borderline oligohydramnios group. However, they reported no increased incidence of fetal distress and neonatal mortality rate in the borderline oligohydramnios group.<sup>18</sup>

In this study, the rate of caesarean section done for fetal distress in borderline amniotic fluid group was 58.1%. Ulker et al reported that the rate of caesarean section for fetal distress was 44% in women with borderline amniotic fluid and it was significantly higher than among women with normal liquor volume.<sup>11</sup> Similarly, Kwon et al also found that caesarean delivery for fetal distress was more in borderline oligohydramnios group.<sup>5</sup> So, the presence of borderline oligohydramnios should alert the obstetrician as there is an increased risk of fetal distress and caesarean section, thus warranting increased antepartum surveillance.

Regarding perinatal outcome, in this study there was no significant difference in growth restricted babies between the two groups. However, Banks et al found a fourfold increase in the incidence of growth restricted babies among women with borderline oligohydramnios and Gumus et al also found an increased incidence of growth restricted babies among women with borderline oligohydramnios.<sup>19,6</sup> The low rate of growth restricted babies in our study could be because of the fact that these women were recruited only when in labor and any growth restriction if identified earlier in the antenatal period could have been managed at that time. It could also be due to the exclusion of cases with medical disorders in this study which could have predisposed towards growth restriction.

In our study, neonates with an APGAR score less than 7 at 5 minutes of life were significantly higher among women with borderline oligohydramnios (8.4%) as compared to women with normal liquor volume (3%). The rate of NICU admission was also significantly higher among women with borderline oligohydramnios (18.18%) as compared to women with normal liquor volume (7.8%). Similar to our study, Kwon et al also observed a greater risk of neonates with an APGAR score less than 7 at 5 minutes of life and more NICU admission among women with borderline AFI.<sup>5</sup> Banks

et al evaluated the perinatal outcome (intrapartum fetal distress, 5 minutes APGAR score < 7 and meconium stained liquor) in women with borderline AFI and found that there was a twofold increase in the incidence of adverse perinatal outcomes.<sup>19</sup> Similarly, Gumus et al also observed a significantly increased incidence of NICU admissions in women with borderline AFI.<sup>6</sup> Hashimoto et al reported that though Apgar score < 7 at 5 minutes of birth did not differ between two groups, the rate of NICU admission was significantly higher in the borderline AFI group which was 20.2% and was similar to our study.<sup>20</sup> Ghike et al also reported the incidence of NICU admission as 19.05% which was similar to ours of 18.8% but they did not find any difference in APGAR score at 5 minutes.<sup>13</sup> Asgharia et al reported the incidence of NICU admission as 14.9% and Apgar score < 7 at 5 minutes of birth as 20.2% in women with borderline oligohydramnios and both values were significantly higher than that seen in women with normal liquor volume.<sup>21</sup>

In contrast to our study, Jamalet al reported that though there was a higher incidence of meconium stained liquor in women with borderline AFI, there was no significant difference in 5 minutes APGAR score, birth weight and NICU admission.<sup>15</sup> Similarly in study done by Yaqoob et al, adverse perinatal outcomes were not found to be associated with borderline AFI.<sup>22</sup>

There were two neonatal deaths observed among women with borderline oligohydramnios and no deaths among women with normal liquor volume. Although the difference in perinatal mortality rate was not statistically significant, the attending obstetrician needs to be careful while managing such cases.

From this study, it can be concluded that borderline oligohydramnios, when compared with normal liquor volume is associated with increased incidence of meconium stained amniotic fluid, fetal distress and caesarean delivery. There is also a significantly higher likelihood of babies with a low APGAR score at 5 minutes and more chances of admission to NICU.

Despite the association of borderline AFI with some adverse outcomes, delivery based on liquor volume only is not justifiable. But increased antepartum surveillance and better monitoring is mandatory in such cases in order to avoid adverse outcomes. Determination of AFI can be used as an adjunct to other methods of fetal surveillance to identify pregnancies at risk of poor perinatal outcomes.

REFERENCES

1. Phelan JP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment with the four-quadrant technique at 36–42 weeks' gestation. *J Reprod Med* 1987; 32:540–42.
2. American College of Obstetricians and Gynecologists. Antepartum Fetal Surveillance. Washington DC: American College of Obstetricians and Gynecologists; 1999, reaffirmed 2009. Practice bulletin 9.

3. American College of Obstetricians and Gynecologists: Ultrasonography in Pregnancy. Washington DC: American College of Obstetricians and Gynecologists; 2009. Practice bulletin 101.
4. Baron C, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Am J ObstetGynecol* 1995;173:167–74.
5. Kwon JY, Kwon HS, Kim YH, Park YW. Abnormal Doppler velocimetry is related to adverse pregnancy outcome for borderline amniotic fluid index in the third trimester. *J ObstetGynecol Res* 2006;32:545–9.
6. Gumus II, Koktencer A, Turhan NO. Perinatal outcome of pregnancies with borderline amniotic fluid index. *Arch GynecolObstet* 2007; 276:17–19.
7. Magann EF, Chauhan SP, Hitt WC, Dubil EA, Morrison JC. Borderline or marginal amniotic fluid index and peripartum outcomes. *JUM* 2011;30:523-28.
8. Wing DA, Fishman A, Gonzalez C, Paul RH. How frequently should amniotic fluid index be performed during the course of antepartum testing? *AmJObstetGynecol* 1996;174:33-6.
9. Moore TR, Cayle JE. The Amniotic fluid index in normal human pregnancy. *Am J ObstetGynecol*1990; 162:1168-73.
10. Jeng CJ, Lee JF, Wang KG, Yang YC, Lan CC. Decreased amniotic fluid index in term pregnancy. *J Reprod Med* 1992; 37:789–92.
11. Ulker K, Ozdemir IA. The relation of intrapartum amniotic fluid index to perinatal outcomes. *Kafkas J Med Sci* 2011;1:1-7.
12. Nazlima N, Fatima B. Oligohydramnios at third trimester and perinatal outcome. *Bangl Med Sci* 2012; 11:33-36.
13. Ghike S, Reddy G, Ghike NW. Increasing severity of oligohydramnios: A risk factor for outcome. *J South Asian FederObstGynaec* 2013;5:8-10.
14. Conway DL, Adkins WB, Schroeder B, Langer O. Isolated oligohydramnios in the term pregnancy: Is it a clinical entity? *J Matern- Fetal Medicine* 1998;7:197-200.
15. Jamal A, Abbasi S, Mesdaghima S. Borderline amniotic fluid index and adverse perinatal outcome. *Ultrasound ObstetGynecol* 2008;32:391-93.
16. Patel RR, Rathod HM, Punata PS, Rathod H. Perinatal outcome in women with oligohydramnios during 3<sup>rd</sup> trimester of pregnancy at Guru Gobind Singh Hospital – Jamnagar, Gujarat. *Int J Rep Med* 2013;2:20-23.
17. Blaras K, Theodora M, Papantoniou N, Syndos M, Mesogitis S, Antsaklis A. Borderline oligohydramnios in singleton pregnancies with intact fetal membranes in the third trimester: Obstetric management and perinatal outcome. *Arch Dis Child Fetal Neonatal* 2010; 95(S1):29.
18. Luo X, Huang Y, Liang R. Analysis of 196 cases of trial of labor with borderline oligohydramnios assessed by ultrasound [in Chinese]. *Zhonghua Fu Chan KeZaZhi* 1988; 33:585–7.
19. Banks EH, Miller DA. Perinatal risks associated with borderline amniotic fluid index. *Am J ObstetGynecol* 1999; 180:1461–3.
20. Hashimoto K, Kasdaghi T, Sharoky C et al. Perinatal outcome of mildly decreased AFI in third trimester. *Ultrasound ObstetGynecol* 2011;38(S1):53.
21. Asgharia M, Faraji R, Salamat F, Ashrafkhani B, Heirati SFD, Naimian S. Perinatal outcomes of pregnancies with borderline versus normal amniotic fluid index. *Iran J Reprod Med* 2013;11:705–10.
22. Yaqoob S, Iqbal R. Relation between borderline amniotic fluid index and perinatal outcome. *Pak J Med Health Sci* 2009; 2: 361-4.