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Research Article

## Perinatal outcome in oligohydramnios and borderline amniotic fluid index: a comparative study

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### ABSTRACT

**Background:** Oligohydramnios is associated with adverse perinatal outcome in the form of meconium staining, intrauterine growth restriction (IUGR), caesarean section for abnormal fetal heart rate tracing, low Apgar score and neonatal intensive care unit (NICU) admission.

**Methods:** This was a prospective study of 100 singleton pregnancies beyond 28 weeks of gestation with AFI < 8 cm, delivered within seven days of admission. Patients were divided in two groups, those with AFI ≤ 5 cm and borderline AFI of 5.1 to 8 cm. Perinatal outcome was studied in the form of onset of labor, mode of delivery, fetal heart rate variations, meconium staining and lower segment caesarean section (LSCS) for fetal distress, Apgar score, birth weight, NICU admission and neonatal mortality.

**Results:** Patients with oligohydramnios with AFI ≤ 5 cm were significantly associated with IUGR and presence of abnormal umbilical artery Doppler velocimetry (p < 0.05). Adverse perinatal outcome was seen in higher percentage of patients having AFI ≤ 5 cm than with borderline AFI. The difference was statistically significant for overall caesarean delivery rate and LSCS for fetal distress (p < 0.05).

**Conclusions:** Oligohydramnios with AFI of ≤ 5 cm is associated with high caesarean delivery rate and LSCS for fetal distress.

**Keywords:** Perinatal outcome, Amniotic fluid index, AFI; Oligohydramnios, Borderline, Marginal

### INTRODUCTION

The amniotic fluid volume has made its assessment an important part of antenatal fetal surveillance. Abnormal amniotic fluid volume may be the only or earliest sonographic sign of an obstetric problem.<sup>1</sup> About 3-8% of pregnant women are found to have low amniotic fluid at some point, usually in the 3<sup>rd</sup> trimester. It is usually perceived as a sign of placental insufficiency.

Perinatal outcome in the form of meconium staining, IUGR, cesarean section for abnormal FHR tracing, low Apgar score and neonatal intensive care unit admission have been associated with reduced amniotic fluid volume.<sup>1-3</sup>

The semi quantitative method of calculating an AFI by using ultrasound to measure the sum of the deepest pockets of amniotic fluid in the 4 quadrants of maternal abdomen is the most common method of quantifying amniotic fluid volume. The sonographic diagnosis of oligohydramnios is usually based on an AFI ≤ 5 cm or on a single deepest pocket of amniotic fluid ≤ 2 cm (American College of Obstetricians and Gynecologists, 2012).<sup>4</sup> Phelan defined oligohydramnios as AFI less than or equal to 5 cm and 5.1 to 20 as normal.<sup>5</sup> Borderline or marginal oligohydramnios has been defined by different cutoffs by various authors. Phelan et al and others defined borderline AFI between 5.1 to 8 cm.<sup>5-9</sup> Gumus et al, Banks and Miller defined as an AFI of 5.1 to 10 cm.<sup>10,11</sup> Kreiser defined it as AFI > 5 cm but below the 2.5<sup>th</sup> percentile which would be AFI between 6 to 9 cm.<sup>12</sup>

The purpose of this study is to compare the outcome in oligohydramnios (AFI  $\leq 5$  cm) with borderline AFI of 5.1 to 8 and to determine the perinatal outcome with decreasing amniotic fluid volume.

**METHODS**

This was a prospective study of 100 pregnant women over a period of 24 months.

The Inclusion Criteria were singleton pregnancy of more than 28 weeks with AFI  $\leq 8$  cm with intact membranes and delivered within 7 days of admission. The Exclusion Criteria were rupture of membranes and congenital anomalies of the fetus.

In the study period, we analyzed 100 cases fitting into the inclusion criteria. For all the selected cases, thorough history was taken and complete examination was done. For all the women, ultrasound examination was done and amniotic fluid index was calculated by four quadrant amniotic fluid volume measurement technique as described by Phelan et al.<sup>5</sup> Umbilical Artery (UA) Doppler studies were also done at the same time.

For the purpose of this study, as described by Phelan et al, the patients with decreased amniotic fluid index were further divided into those with oligohydramnios i.e. AFI  $\leq 5$  cm and those with borderline AFI of 5.1 to 8 cm.

Out of 100 cases, 49 patients had oligohydramnios while 51 patients had borderline AFI. Depending upon other obstetric factors, investigations and clinical assessment decision for elective caesarean section and induction of labour was taken in some patients. Patients with spontaneous and induced labour were monitored with cardiotocography in the intrapartum period.

Maternal outcome in the form of onset of labour, mode of delivery, labour related events like abnormal fetal heart rate, meconium staining of liquor and LSCS for fetal distress were studied. Perinatal Outcome in the form of Apgar score at 1 min and 5 min; Birth weight, NICU admission and neonatal mortality were studied.

Results were tabulated and statistically analyzed. P value less than 0.05 was considered statistically significant.

**RESULTS**

Amongst the study group, 49% of cases had oligohydramnios (AFI  $\leq 5$  cm) as against 51% with marginal or borderline AFI. There was no statistical difference in age, parity and gestational age in both the groups. The mean amniotic fluid index in the first group with AFI  $\leq 5$  cm was  $3.48 \pm 1.10$  and that of second group with AFI of 5.1 to 8 cm was  $6.69 \pm 0.75$ . (Table 1).

**Table 1: Demographics/characteristics.**

	AFI $\leq 5$ (n=49)	AFI 5.1 to 8 (n=51)	p-value
Maternal age (mean $\pm$ sd)	25.31 $\pm$ 5.06	24.49 $\pm$ 4.46	0.394
Parity			
Nulliparous	31 (63.2%)	32 (62.7%)	0.971
Multiparous	18 (36.7%)	19 (37.2%)	0.972
Gestational age (mean $\pm$ sd)	37.95 $\pm$ 2.29	37.49 $\pm$ 2.46	0.336
Amniotic fluid index (mean $\pm$ sd)	3.48 $\pm$ 1.10	6.69 $\pm$ 0.75	-

On comparison of mode of delivery in between both the groups, a statistically significant difference was observed for caesarean section in oligohydramnios with AFI  $\leq 5$  cm group compared to AFI of 5.1 to 8 cm group (Table 2).

**Table 2: Mode of delivery.**

	AFI $\leq 5$ (n=49)	AFI 5.1 to 8 (n=51)	p-value
Vaginal	9 (18.3%)	27 (52.9%)	0.017
Instrumental Vag.	4 (8.1%)	5 (9.8%)	0.907
Caesarean section	36 (73.4%)	19 (37.2%)	0.008

**Table 3: Associated antepartum risk factors.**

Associated risk factors	AFI $\leq 5$ (n=49)	AFI 5.1 to 8 (n=51)	p-value
PIH	17 (34.6%)	14 (27.4%)	0.612
IUGR	22 (44.8%)	7 (13.7%)	0.023
Abruptio placentae	3 (6.1%)	2 (3.9%)	0.883
Severe anemia	2 (4.1%)	1 (1.9%)	0.890
Prolonged pregnancy	5 (10.2%)	6 (11.7%)	0.917
Isolated oligohydramnios (No obvious risk factor)	15 (30.6%)	25 (49%)	0.190
UA velocimetry			
Normal	28 (57.1%)	43 (84.3%)	0.052
Abnormal	21 (42.8%)	8 (15.6%)	0.049
Increased SD ratio	13 (26.5%)	4 (7.8%)	
Absent diastolic flow	5 (10.2%)	2 (3.9%)	
Reversal of flow	3 (6.1%)	2 (3.9%)	

**Table 4: Perinatal outcome in the two groups.**

Parameter	AFI ≤ 5 (n=49)	AFI 5.1 to 8 (n=51)	p-value
Induction of labor	18 (36.7%)	10 (19.6%)	0.226
Non-reassuring FHR	21 (42.8%)	14 (27.4%)	0.276
Meconium stained liquor	18 (36.7%)	13 (25.4%)	0.426
LSCS - Fetal Distress	17 (34.6%)	6 (11.7%)	0.002
Other indication	19 (38.7%)	13 (25.4%)	
Birth Weight < 2500 gm	33(67.3%)	33(64.7%)	0.854
>2500 gm	16(32.6%)	18(35.2%)	
Apgar score <7 at 1 min	13(26.5%)	6 (11.7%)	0.296
<7 at 5 min	4 (8.1%)	3 (5.8%)	0.879
Admission to NICU	14 (28.5%)	10 (19.6%)	0.532
Neonatal Death	0	2 (3.9%)	-

**Table 5: Comparison of Abnormal FHR pattern and LSCS rates in different studies in both groups.**

	Ghike et al		Dasari et al		Present study	
	AFI ≤5cm	AFI 5.1 to 8cm	AFI ≤ 5cm	AFI 5.1 to 8cm	AFI ≤ 5cm	AFI 5.1 to 8cm
Abnormal FHR	53%	44%	45.95%	23.8%	42.8%	27.4%
LSCS Rate	35.1%	14.28%	41.2%	12.5%	73.4%	37.2%

Associated high risk factors were observed in the groups which included pregnancy induced hypertension (31%), intrauterine growth restriction (29%), prolonged pregnancy (11%), abruptio placentae (5%) and severe anemia (3%). In 40% of the cases no obvious high risk factors (isolated oligohydramnios) were observed. Umbilical artery Doppler studies showed that out of the 29% patients with abnormal Doppler, 17% had increased SD ratio, whereas absent diastolic flow and reversal of flow was seen in 7% and 5% cases respectively (Table 3).

Outcome parameters in both the groups were analysed. Labor was induced in 36.7% patients with oligohydramnios as compared to 19.6% patients with borderline AFI. More number of patients amongst oligohydramnios required caesarean section as compared to borderline AFI group. The occurrence of non-reassuring FHR pattern in the form of late and variable decelerations was more in oligohydramnios (42.8%) than borderline AFI (27.45%). Meconium stained liquor was found in 31% patients. Fetal distress was the indication for LSCS in 41.8% of all LSCS. It was significantly higher in oligohydramnios group than borderline AFI group. We observed that 67.34% of oligohydramnios had

birth weight less than 2.5 kg, whereas it was 64.7% in the borderline AFI group. Apgar score of <7 at 1 was seen in 26.5% of the babies from oligohydramnios group as against 11.7% from borderline AFI group. 28.5% babies from oligohydramnios group required NICU admission. There were 2 neonatal deaths one due to sepsis and the other due to meconium aspiration (Table 4).

**DISCUSSION**

Amniotic Fluid Volume assessment is one of the important component of Biophysical Profile and an important tool in antepartum fetal surveillance to predict the perinatal outcome. Multiple studies are being carried out to compare the perinatal outcome of normal AFI with oligohydramnios. The concept of borderline AFI with sonographic estimate of amniotic fluid volume of 5.1 to 8 was originally described by Phelan et al and later by different authors.<sup>5</sup> Considering the adverse perinatal outcome in patients with borderline AFI and with oligohydramnios of AFI ≤5 cm, there is still uncertainty about whether both the groups should be combined and treated similarly. In this study the perinatal outcome was compared in these two groups.

In the present study both the groups were comparable in terms of age, parity and gestational age. Amongst the associated antepartum risk factors IUGR was more significantly associated with oligohydramnios than borderline AFI (p < 0.05). The Umbilical Artery Doppler velocimetry was abnormal in 42.8% cases with AFI ≤ 5 as compared to 15.6% cases with borderline AFI and the difference was statistically significant (p < 0.05). Magann et al, in their review on borderline or marginal AFI with peripartum outcome concluded that ultrasonography could be considered for evaluating fetal growth which may help in decision making in such cases.<sup>13</sup> In the study by Kwon et al, it was observed that when abnormal Doppler velocimetry was associated with borderline AFI there was 5-fold increase in the incidence of adverse perinatal outcome.<sup>8</sup>

In the present study, 38% patients went in spontaneous labor, 28% were induced and 34% were taken up for elective LSCS. More number of patients (36.7%) from oligohydramnios required induction of labour than borderline AFI group but the difference was not statistically significant.

Though percentage of abnormal FHR tracing in the form of late and variable decelerations was more in patients with oligohydramnios, the difference was not found to be statistically significant.

Meconium staining of liquor was found in 36.73% of oligohydramnios and 25.4% of borderline AFI, but the difference was not statistically significant. Ghike et al found meconium staining of liquor in 54% of cases with oligohydramnios and 26.9% with borderline AFI and found the difference to be statistically significant.<sup>14</sup>

We found that the rate of cesarean delivery was 73.4% in oligohydramnios with AFI  $\leq 5$  cm group which is double as compared to other group (37.2%) and was statistically significant ( $p < 0.05$ ). Similar observations are noted by Ghike et al.<sup>14</sup> Caesarean section for fetal distress was noted in 34.6% cases of oligohydramnios and 11.7% cases of borderline AFI, the difference is statistically significant ( $p < 0.05$ ). Ghike et al found rate of cesarean section for fetal distress as 29.73% in oligohydramnios as compared to 9.52% in borderline group and found the difference to be statistically significant.<sup>14</sup>

Findings of studies by Ghike et al, Dasari et al and present study comparing abnormal FHR pattern and LSCS rates in both groups showed a statistically significant higher rate of LSCS amongst cases with oligohydramnios (Table 5).<sup>14,15</sup>

We did not find any significant difference with respect to low birth weight in between the two groups. The number of low birth weight babies in our study is comparable to study by Chandra et al (61.53%).<sup>16</sup>

There was no statistically significant difference in both the groups with regard to 1 minute Apgar  $< 7$  and 5 minute Apgar  $< 7$ . NICU admission rate was 24% out of which 2 were neonatal deaths (3.9%). Ghike et al concluded that Apgar  $\leq 7$  at 1 min and NICU admission rate was more in oligohydramnios group than borderline and found the difference to be statistically significant.<sup>14</sup> They had 5.4% mortality in oligohydramnios and 1.59 in borderline group. Dasari et al had reported 2.9% perinatal mortality in oligohydramnios.<sup>15</sup>

In the study by Kreiser et al, pregnancy outcome was assessed in 2 groups (AFI  $\leq 5$  with AFI  $> 5$  cm but  $< 2.5^{\text{th}}$  percentile) where they found no statistically significant differences with respect to labor induction for abnormal NST, cesarean section for FHR abnormalities, presence of meconium and Apgar score  $< 7$  at 5 minutes.<sup>12</sup> There were no perinatal deaths in either group.

In the present study, overall cesarean delivery rate and LSCS for fetal distress was significantly higher in oligohydramnios group as compared to borderline AFI group. This may be because of presence of more number of cases with associated risk factors like IUGR and abnormal umbilical artery Doppler velocimetry studies in that group. There is a possibility that awareness of AFI status at the early stages is also likely to influence the cesarean section rate.<sup>17</sup>

Since there was no statistically significant difference observed in the perinatal outcome in both the groups pertaining to induction of labour, non-reassuring FHR, meconium stained liquor, Apgar score of  $< 7$  at 1 min and 5min. and NICU admissions, it may be concluded that both groups can be managed similarly. However further studies are required to support our findings.

## CONCLUSION

An amniotic fluid index of  $\leq 5$  cm is commonly associated with intrauterine growth restriction and abnormal umbilical artery Doppler velocimetry studies. Adverse perinatal outcome is seen in higher percentage of patients having oligohydramnios than that of borderline AFI. Statistically significant difference for overall cesarean delivery rate as well as LSCS for fetal distress mandates the need for close antepartum and intrapartum monitoring.

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## REFERENCES

1. Williams Obstetrics. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC III, Hauth JC, Wenstrom KD: 21st Edition USA; McGraw Hill. Fetal Growth & Development. Chapter 7: 142-143.
2. Moore TR. Amniotic fluid dynamics reflect fetal and maternal health and disease. *Obstet Gynecol.* 2010;116:759-65.
3. Sarno Albert P, Ahn Myoung O, Phelan Jeffrey P. Intrapartum Amniotic Fluid at Term. *J Reprod Med.* 1990;35:719-23.
4. American College of Obstetrician and Gynecologists: Antepartum fetal Surveillance, Practice Bulletin No. 9, October 1999, Reaffirmed 2012.
5. Phelan AP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment with the four quadrant technique at 36-42 week's gestation. *J Reprod Med.* 1987;32:540-2.
6. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The four quadrant assessment of amniotic fluid volume: An adjunct to antepartum fetal heart rate testing. *Obstet Gynecol.* 1987;70:353-6.
7. Baron C, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Am J Obstet Gynecol.* 1995;173:167-74.
8. 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 Obstet Gynecol Res.* 2006;32:545-9.
9. Petrozella LN, Dashe JS, McIntire DD, Leveno KJ. Clinical significance of borderline amniotic fluid index and oligohydramnios in preterm pregnancy. *Obstet Gynecol.* 2011;117(2 Pt 1):338-42.
10. Gumus II, Koktener A, Turhan NO. Perinatal Outcome of pregnancies with borderline amniotic fluid index. *Arch Gynecol Obstet.* 2007;276:17-9.
11. Banks EH, Miller DA. Perinatal risks associated with borderline amniotic fluid index. *Am J Obstet Gynecol.* 1999;180:1461-3.

12. Krieser D, El-Sayed YY, Sorem KA, Chitkara U, Holbrook RH, Druzin ML. Decreased amniotic fluid index in low-risk pregnancy. *J Reprod Med.* 2001;46:743-6.
13. Magann EF, Chauhan SP, Hitt WC, Dubil EA, Morrison JC. Borderline or Marginal Amniotic Fluid Index and Peripartum Outcomes. A Review of Literature. *J Ultrasound Med.* 2011;30:523-8.
14. Ghike Sunita, Reddy G, Ghike NW. Increasing Severity of Oligohydramnios: A risk factor for outcome. *J South Asian Feder Obst Gynae.* 2013;5(1):8-10.
15. Dasari P, Niveditta G, Raghavan S. The maximal vertical pocket and amniotic fluid index in predicting fetal distress in prolonged pregnancy. *Int J Gynaecol Obstet.* 2007;96:89-93.
16. Chandra P, Kaur SP, Hans DK, Kapila AK. Aug. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Obstet and Gynae Today.* 2000;5(8):478-81.
17. Chauhan SP, Washburne JF, Magann EF, Perry KG Jr, Martin JN, Morrison JC. A randomized study to assess the efficacy of the amniotic fluid index as a fetal admission test. *Obstet Gynecol.* 1995;86:9-13.

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