

## Perinatal outcomes of pregnancies with borderline versus normal amniotic fluid index: A prospective study

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### ABSTRACT

**Introduction:** Amniotic fluid cavity filled with liquor amnii is a natural floating bed for fetus required for its existence and growth in sterile environment, regulation of temperature, avoidance of external injury and reduction of impact of uterine contractions. Amniotic fluid has high influence on the fetal outcome and is directly related to the perinatal morbidity and mortality. This study aims to compare the pregnancy outcomes in patients with borderline Amniotic Fluid Index (AFI) between 5-8 cm and normal AFI = 8-24 cm.

**Method:** This was a prospective observational study of 108 pregnant women. After AFI assessment with ultrasound, they were categorized into two groups: those with AFI 5-8 cm (Group 1) and with AFI = 8-24 cm (Group 2) accordingly. Pregnancy outcomes was noted in terms of mode of delivery, amniotic fluid colour & fetal birth weight.

**Result:** The Cesarean section rate was higher in borderline AFI group in comparison to the normal AFI group {28 (51.8%) vs 14 (26%) P-value =0.003}. There was no difference in instrumental delivery. The incidence of meconium stained amniotic fluid was significantly higher in borderline AFI group {28 (51.9%) vs 13 (24.1 %), P-value=0.003}. 10 (18.5%) newborns had fetal birth weight of <2.5 kg in borderline AFI group & 1 (1.9%) newborns had fetal birth weight <2.5 kg in normal AFI group (P-value 0.004).

**Conclusion:** Amniotic Fluid Index between 5-8 cm during term pregnancy has a significant association with higher rate of Cesarean section during delivery, higher rate of meconium staining of liquor & a significantly higher rate of low birth weight.

**Keywords:** amniotic fluid index, fetal outcomes, maternal outcomes

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## INTRODUCTION

Nature has made floating bed in a form of amniotic fluid cavity filled with liquor amnii for the requirement of fetus, for its existence and growth in sterile environment, regulation of temperature, avoidance of external injury and reduction of impact of uterine contractions.<sup>1</sup> It is necessary for baby's proper growth and development. It cushions the fetus from physical trauma, permits fetal lung growth and provides barrier against infections.

Among different methods of assessing amniotic fluid, most commonly used method is Ultrasonography guided AFI evaluation or single deep vertical pocket measurement. AFI is commonly utilized and is the best of current clinical assessment of amniotic fluid volume.<sup>2</sup> According to Phelan et al, AFI <5 is termed oligohydramnios, AFI between 5.1-8 is termed borderline oligohydramnios, AFI between 8.1-24 is termed normal & AFI >24 is termed polyhydramnios.<sup>2</sup> Amniotic fluid volume has high influence on the fetal outcome and is directly related to the perinatal morbidity and mortality rate. Some studies show that Amniotic fluid Index is a poor predictor of adverse outcome.<sup>3-5</sup> Whereas some authors have not confirmed the association of adverse perinatal outcome with oligohydramnios.<sup>6-8</sup>

This study aims to compare the pregnancy outcomes in patients with borderline AFI between 5-8 cm and normal AFI  $\geq$  8-24 cm in terms of maternal and fetal complications so that appropriate intervention if needed can be taken at appropriate time.

## METHOD

A prospective comparative study was carried out in the Department of Obstetrics & Gynecology, Institute of Medicine - Tribhuvan University Teaching Hospital (IOM-TUTH), Kathmandu from April 9, 2016 to August 9, 2017 on 108 pregnant women selected by convenience sampling technique.

Ethical approval was taken from the Institutional Review Committee of IOM-TUTH. Informed written consent was obtained from all the patients. Inclusion criteria were pregnant women at more than 37 weeks gestation, singleton pregnancy, those with intact membranes and AFI between 5 and 24 cm. Exclusion criteria were women with history of congenital uterine anomalies, history of genital tract malignancies

and those who did not consent to participate in the study.

For all the selected cases, thorough history was taken and complete examination was done. The previous obstetric records and ultrasound reports were reviewed. Period of gestation was calculated by last menstrual period, those who didn't remember last menstrual period or having irregular cycle period of gestation was calculated by the patient's early scan.

Ultrasonography (USG) was taken as the medium of assessing AFI. USG was done at the Department of Radiology, IOM-TUTH by an experienced consultant radiologist. Amniotic fluid index was measured using technique as described by Phelan, et al.<sup>2</sup>: Patient was kept in supine position; a linear, curvilinear or sector transducer was used, uterus was divided into 4 quadrants using the maternal sagittal midline vertically and an arbitrary transverse line approximately halfway between symphysis pubis and upper edge of uterine fundus. Transducer was kept parallel to the maternal sagittal plane and perpendicular to the maternal coronal plane throughout. The deepest unobstructed and clear pocket of amniotic fluid was visualized and the image frozen. Ultrasound calipers were manipulated to measure the pocket in a strictly vertical direction. The process was repeated in each four quadrants and pocket measurement summed, which gives AFI. If AFI is less than 8, four quadrant evaluation needs to be performed three times and average the values. Grading of AFI was done as described by Phelan et al<sup>2</sup>, AFI between 5.1-8 was termed borderline oligohydramnios, AFI between 8.1-24 was termed normal.

After amniotic fluid index (AFI) assessment, they were categorized into two groups: those with AFI 5-8 cm (Group 1) and with AFI 8-24 cm (Group 2) accordingly. Pregnancy outcomes was noted in terms of mode of delivery, amniotic fluid colour & fetal birth weight.

Data was entered using Microsoft Excel 2007 and was analysed by statistical package for social sciences (SPSS) version 17.0. Association between two categorical variables were analysed by Chi-square test. (P-value less than 0.05 was considered as statistically significant).

## RESULT

A total of 108 cases were included in the study of which both Group 1 with AFI between 5-8 cm and

Group 2 with AFI between 8-24 cm had equal distribution of 54 cases selected by convenience sampling technique.

Out of 108 women, 54 (50%) women were in the age group 18-25 years, 47 (43.5%) were in the age group 26-32 years, 6 (5.6%) were in age group 33-39 years and 1 (0.9%) woman was above 40 years of age. In regards to parity distribution, 67 (62%)

women were primigravida and 41 (38%) women were multigravida. Period of gestation was between 37-40 weeks in 80 (74.1%) women, between 40-42 weeks in 13 (24.1%) women and more than 42 weeks in 1 (0.9%) woman.

Table 1, 2 and 3 shows comparison of mode of delivery, amniotic fluid colour and fetal birth weight between group 1 and group 2.

**Table 1. Comparison of mode of delivery in relation to AFI**

Mode Of delivery	AFI		Total (n=108)	P-value
	5-8 cm (n=54)	8-24 cm (n=54)		
Normal delivery	20 (37%)	34 (63%)	54 (50%)	0.003
Instrumental delivery	6 (11.1%)	6 (11.1%)	12 (11.1%)	
Elective Lower Segment Cesarean Section (LSCS)	4 (7.4%)	7 (13%)	11 (10.2%)	
Emergency LSCS	24 (44.4%)	7 (13%)	31 (28.7%)	

**Table 2. Comparison of amniotic fluid colour in relation to AFI**

Colour of liquor	AFI		Total (n=108)	P-value
	5-8 cm (n=54)	>8-24 cm (n=54)		
Clear	26 (48.1%)	41 (75.9%)	67 (62%)	0.003
Meconium- stained	28 (51.9%)	13 (24.1%)	41 (38%)	

**Table 3. Comparison of fetal birth weight in relation to AFI**

Birth weight	AFI		Total (n=108)	P-value
	5-8 cm (n=54)	>8-24 cm (n=54)		
< 2.5 kg	10 (18.5%)	1 (1.9%)	11 (10.2%)	0.004
>/=2.5 kg	44 (81.5%)	53 (98.1%)	97 (89.8%)	

## DISCUSSION

Considering induction of labour, in our study, Group 1 had higher rate of induction of labour when compared with Group 2. When mode of termination was looked upon, in Group 1 Cesarean section rate was 51.8% compared to 26% in case of Group 2. There were various reasons associated with it. Cases with AFI of 5 cm or less were directly taken for Cesarean section assuming increasing intrapartum complications if induction was conducted. Thus, overall Caesarean section rate was higher in Group 1. Most common indication for Cesarean sections were fetal distress followed by failed induction. Coming to instrumental delivery, vacuum was the only used instrument and both the groups had equal number of instrumental delivery. All these results were comparable to several studies. Sarno, et al., found that intrapartum oligohydramnios was associated with an increased risk of Cesarean section, indication mostly being fetal distress.<sup>9</sup> Another retrospective case-control study performed at The Liverpool Maternity Hospital showed a higher risk of induction for fetal reasons.<sup>10</sup> In a study conducted at Postgraduate Medical Institute, Lady Reading Hospital, Peshawar 15 (36%) out of 39

cases ended in Cesarean section and the majority of these were for fetal distress.<sup>11</sup>

Passage of Meconium is considered normal in cases of post-term pregnancies but its presence is also one of the sign of fetal distress. Taking this into mind, colour of amniotic fluid was noted. In Group 1, 26 (48.1%) had clear amniotic fluid, 28 (51.9%) had meconium-stained liquor whereas in Group 2 out of 54, 41 (75.9%) had clear amniotic fluid whereas 13 (24.1%) had meconium stained liquor. Group 1 had more meconium-stained liquor compared to Group 2. This might be due to more induction and trial of labour offered to borderline oligohydramnios group. The above results were statistically significant. These findings are comparable with the findings of Chate et al who in a prospective case control study of 50 cases with diagnosis of oligohydramnios showed increased incidence of Thick meconium stained liquor.<sup>12</sup> These findings contrasted with the findings of Magnann et al who concluded that no statistical difference were found between the two groups in the risk of thick meconium stained amniotic fluid.<sup>13</sup> Another study by Bangal et al concluded that meconium stained amniotic fluid was identified less often in pregnancies complicated by

oligohydramnios.<sup>14</sup> Variation in sample sizes could be the reason for these differences. Both the above studies have a larger sample size than ours.

Birth weight distribution among the two groups showed that 44 (81.5%) in Group 1 and 53 (98.1%) in Group 2 had birth weight more than 2.5 kg. This result wasn't statistically significant whereas 10 (18.5%) in Group 1 had birth weight less than 2.5 kg compared to only 1 (1.9%) case in Group 2, this result was statistically significant. These findings are comparable with the findings of Roberts et al who showed that there was fourfold risk of low birth weight (LBW) and high rate of admission to NICU in case of oligohydramnios.<sup>10</sup> In a study by Rhee, et al., at Mizmede Hopital, Seoul, South Korea, there were statistically significant difference between two groups in birth weight.<sup>15</sup> Also in a prospective case control study, Chate, et al., concluded that in oligohydramnios group, there was increased chance of birth weight less than 2.5 kg.<sup>12</sup>

In our study, in both the groups, majority of cases were in age group of 18 to 25 years, which consisted of 26 (48.1%) in case of Group 1 and 28 (51.9%) in Group 2. There was only 1 case with age more than 40 years which belonged to Group 1. The mean age for Group 1 was 26.6 years as opposed to 26.2 years in Group 2. There was no statistical significance when age groups were compared. Similar results were seen in a study conducted by Nazlima et al where maximum number of cases belonged to same age group as that of present study.<sup>16</sup> In the same study, the mean age was found to be 24.5. In another study conducted by Magann et al found the mean age for oligohydramnios group to be 24.9.<sup>17</sup> Both the results were comparable with our study.

Our study had few limitations like a small sample size, a single centre study, a single observer and convenience sampling technique. Further study on the subject with a larger sample size, involvement of multiple centres and observers as well as use of a better sampling technique could further improve the study.

## CONCLUSION

Our findings show that women with borderline AFI were associated with high rate of Cesarean section in account of mode of delivery compared to those with normal AFI. Further comparing emergency to elective Cesarean section, emergency Cesarean section rate was higher in borderline AFI. Meconium staining of liquor and low birth weight

of newborns was seen more in those with borderline AFI than in those with normal AFI.

## ACKNOWLEDGEMENT

All the women who participated in this study.

## REFERENCES

1. Jagatia K, Singh N, Patel S. Maternal and fetal outcome in oligohydramnios- A study of 100 cases. *International Journal of Medical Science and Public Health*. 2013;2(3):724-7.
2. 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(7):540-2.
3. Ahmad H, Munim S. Isolated oligohydramnios is not an indicator for adverse perinatal outcome. *Journal of the Pakistan Medical Association*. 2009;59(10):691. (PMID: 19813684)
4. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid volume: II. The relationship of increased amniotic fluid volume to perinatal outcome. *Am J Obstet Gynecol*. 1984;150(3):250-4.
5. Banks EH, Miller DA. Perinatal risks associated with borderline amniotic fluid index. *Am J Obstet Gynecol*. 1999;180(6 Pt 1):1461-3. (DOI: 10.1016/s0002-9378(99)70037-2)
6. Locatelli A, Zagarella A, Toso L, Assi F, Ghidini A, Biffi A. Serial assessment of amniotic fluid index in uncomplicated term pregnancies: prognostic value of amniotic fluid reduction. *J Matern Fetal Neonatal Med*. 2004;15(4):233-6.
7. Chauhan SP, Hendrix NW, Morrison JC, Magann EF, Devoe LD. Intrapartum oligohydramnios does not predict adverse peripartum outcome among high-risk parturients. *Am J Obstet Gynecol*. 1997;176(6):1130-6.
8. Rainford M, Adair R, Scialli AR, Ghidini A, Spong CY. Amniotic fluid index in the uncomplicated term pregnancy. Prediction of outcome. *J Reprod Med*. 2001;46(6):589-92.
9. Sarno Jr AP, Ahn MO, Phelan JP. Intrapartum amniotic fluid volume at term: Association of ruptured membranes, oligohydramnios and increased fetal risk. *J Reprod Med*. 1990;35(7):719-23.
10. Roberts D, Nwosu EC, Walkinshaw SA. The fetal outcome in pregnancies with isolated reduced amniotic fluid volume in the third trimester. *J Perinat Med*. 1998;26(5):390-5.
11. Jabeen S, Shafqat T, Ahmad S. Oligohydramnios causes and pregnancy outcome-third trimester versus second trimester and significance of amniotic fluid index (AFI). *Journal of Postgraduate Medical Institute (Peshawar-Pakistan)*. 1997;11(2).
12. Chate P, Khatri M, Hariharan C. Pregnancy outcome after diagnosis of oligohydramnios at term. *Int J Reprod Contracept Obstet Gynecol*. 2013;2(1):23-6.

13. Magann EF, Kinsella MJ, Chauhan SP, McNamara MF, Gehring BW, Morrison JC. Does an amniotic fluid index of  $\leq 5$  cm necessitate delivery in high-risk pregnancies? A case-control study. *Am J Obstet Gynecol.* 1999;180(6 Pt 1):1354-9.
14. Bangal VB, Giri PA, Sali BM. Incidence of oligohydramnios during pregnancy and its effects on maternal and perinatal outcome. *J Pharm Biomed Sci (JPBMS).* 2011;12(5):1-4.
15. Rhee MR, Cho HJ, Mi Oh J, Lim OR, Kim EA, Park SS, et al. The relationship between oligohydramnios and perinatal outcomes. *Am J Obstet Gynecol.* 2005;193(6):S100.
16. Nazlima N, Fatima B. Oligohydramnios at third trimester and perinatal outcome. *Bangladesh Journal of Medical Science.* 2012;11(1):33-6.
17. Magann EF, Chauhan SP, Kinsella MJ, McNamara MF, Whitworth NS, Morrison JC. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. *Am J Obstet Gynecol.* 1999;180(6 Pt 1):1354-9.