

# Comparison of Outcome of Borderline and Normal Amniotic Fluid Index in Term Pregnancy

Ansari SN,<sup>1</sup> Baral J,<sup>2</sup> Gurung G,<sup>2</sup> Jha A<sup>3</sup>

<sup>1</sup>Paropakar Maternity and Women's Hospital (PMWH),

Thapathali, Kathmandu, Nepal.

<sup>2</sup>Department of Obstetrics and Gynecology,

<sup>3</sup>Department of Radiology,

Institute of Medicine, Tribhuvan University Teaching Hospital,

Maharajgunj, Kathmandu Nepal.

## Corresponding Author

Shaheen Naaz Ansari

Paropakar Maternity and Women's Hospital (PMWH),

Thapathali, Kathmandu, Nepal.

E-mail: drshaheenansari21@gmail.com

## Citation

Ansari SN, Baral J, Gurung G, Jha A. Comparison of Outcome of Borderline and Normal Amniotic Fluid Index in Term Pregnancy. *Kathmandu Univ Med J.* 2021;73(1):17-21.

## ABSTRACT

### Background

Determination of Amniotic Fluid Index (AFI) is an important component of antepartum assessment of all normal pregnancies.

### Objective

To compare the obstetric interventions and neonatal outcomes in term pregnancies with borderline Amniotic Fluid Index versus normal Amniotic Fluid Index.

### Method

This hospital based prospective study was conducted at Tribhuvan University Teaching Hospital over 1 year between 2017 and 2018 in 128 women having uncomplicated term pregnancy admitted in labor ward. Of the 128 women, 64 women had borderline Amniotic Fluid Index (5.1-8 cm) and 64 normal AFI (8.1 - 24 cm). Parameters studied were induction of labor, cesarean section, instrumental delivery, intrapartum abnormal fetal heart rate, meconium staining of liquor, APGAR score at 5 and 7 minutes, birth weight, neonatal intensive care unit (NICU) admission and neonatal death. Data was analyzed using software OpenEpi.

### Result

Statistically significant difference in result was obtained in the two groups in terms of rate of induction of labor (73.4% vs 35.9%,  $p = 0.0001$ , OR = 4.9), rate of cesarean section (42.1% vs 28.1%,  $p = 0.04$ , OR = 1.8), tachypnea (50% vs 11.1%,  $p = 0.01$ ) and low birth weight (9.1% vs 4.5%,  $p = 0.04$ ). No statistical significance was found in meconium staining of liquor (33% vs 38.3%,  $p = 0.3$ ) and APGAR score of <7 at 5 minutes (3.1% vs 1.5%,  $p = 0.06$ ). There were no neonatal intensive care unit admissions and neonatal mortality in any of the babies.

### Conclusion

Detection of amniotic fluid volume at term is important for timely maternal interventions to improve the overall fetal outcome.

## KEY WORDS

*Borderline amniotic fluid index, Cesarean section, Induction of labor, Meconium stained liquor, Tachypnoea*

## INTRODUCTION

Determination of amniotic fluid volume is an important method of antepartum assessment of all pregnancies, especially for those at risk of fetal death.<sup>1</sup> Phelan et al. who originally described the concept of the AFI, have introduced the term Borderline Amniotic Fluid Volume when Amniotic Fluid Index (AFI) was between 5.1 and 8 cm. About 6% - 44% of women at term pregnancy have borderline AFI.<sup>2</sup> In Nepal the incidence of borderline oligohydramnios has been shown to be 7.7%.<sup>3</sup>

As high as two fold increase in adverse perinatal outcomes such as meconium stained liquor, intrapartum fetal distress, low APGAR, more neonatal intensive care unit (NICU) admissions, neonatal deaths, and increased incidence of cesarean section is associated in the setting of borderline AFI.<sup>4-6</sup> Based on these findings increased rate of antenatal evaluations and inducing otherwise normal patients with borderline AFI at term have been practiced.<sup>7</sup> In contrast, some recent studies have evidenced that in uncomplicated term pregnancies, a borderline AFI does not increase the risk of adverse perinatal outcomes and that diagnosis of borderline AFI leads to increased obstetric intervention without improvement in perinatal outcome.<sup>8,9</sup>

In spite of such contradicting views on borderline AFI, there is no standard guideline on management of borderline AFI at term. American College of Obstetricians and Gynecologists practice bulletins have defined an AFI of greater than 5.0 cm as consistent with a normal amniotic fluid volume.

This study was conducted to compare the obstetric interventions, intrapartum fetal intolerance of labor and neonatal outcome in uncomplicated term pregnancies having borderline and normal AFI.

## METHODS

This prospective study was conducted in department of Obstetrics and Gynecology and department of Radiology, Tribhuvan University Teaching Hospital (TUTH) between 2017 and 2018. The institutional review board of TUTH approved the study. One hundred and twenty-eight women admitted in labour ward were recruited; 64 of them had AFI of 5.1 cm to 8 cm. They were matched in terms of maternal age, gestational age and parity with 64 controls. Inclusion criteria were period of gestation 37-42 weeks, singleton pregnancy, cephalic presentation, AFI between 5.1 to 8 cm for cases, AFI between 8.1 to 24 cm for controls and intact membrane. Exclusion criteria were multi fetal gestation, fetus with congenital anomaly, intrauterine fetal demise, medical comorbidities like preeclampsia, gestational diabetes mellitus and heart disease and obstetric comorbidities like placenta previa, CPD, scarred uterus, uterine anomalies and vaginal bleeding.

AFI detected by ultrasonography done at TUTH within last 7 days was considered for enrollment. Antenatal cards were

reviewed for demographic and antenatal information. Period of gestation (POG) was calculated by last date of menstrual period (LMP). For unknown LMP and irregular cycles, first trimester ultrasound date was taken into account.

AFI was calculated as sum of depth of amniotic fluid pocket in cm in the 4 quadrants of the uterus. Pockets were measured perpendicular to the floor with the patient being supine. The pockets did not contain small fetal parts or umbilical cord. Ultrasound was done on Accuvix A30, Medison or Philips IU22 ultrasonography machine with 3.5 MHz probe under 3<sup>rd</sup> trimester obstetric protocol.

All the study subjects were managed as per labor room protocol. Induction was done with tablet Misoprostol 25 micrograms kept per vaginally 2 doses 6 hours apart after reassessing Bishops score. After 6 hours of 2<sup>nd</sup> dose abdominal and vaginal examination was repeated. If there was no onset of labor or if uterine contraction was inadequate oxytocin infusion was started and artificial membrane rupture was done. In primigravida 5 units of syntocin in 500 ml Ringer Lactate (RL) was started at 10 drops per minute. Infusion was increased every 30 minutes by 10 drops per minute till maximum of 60 drops per minute was reached. In multigravida 2.5 units of syntocin was given. A maximum of 3 pints of syntocin with RL was given. Uterine contraction and fetal heart rate were monitored every 30 minutes. Vaginal examination was done every 4 hours to assess labor progress and color of liquor. In case of fetal distress and hyperstimulation, syntocin was held and managed as per labor room protocol. Intervention like cesarean section was done if indicated. Cases were followed till delivery.

Fetal distress was defined by fetal tachycardia/bradycardia or meconium staining of the liquor. Mode of delivery, APGAR score at 0 and 5 minutes and birth weights were noted. If cesarean section was done its indication was also entered. Neonates were followed till discharge from hospital. If there was neonatal unit NNU/NICU admission indication of transfer was noted. A score of less than 7 at 5 minutes was considered low APGAR score and birth weight of less than 2.5 kg was termed Low Birth Weight (LBW).

Data analysis was done using computer software OpenEpi (Open Source Epidemiology Statistics for Public Health) Version 3.01. Fisher exact, Mid P and Pearson Chi-square test were used, where appropriate, to find association between variables. A 2 tailed 'p' value of < 0.05 was regarded as statistically significant. Odds ratio was used to find the degree of association between variables.

## RESULTS

One hundred and twenty-eight eligible women were enrolled in this study. Equal number of them, 64 each, had borderline (5.1 – 8 cm) and normal (8.1 – 24 cm) AFI.

Mean maternal age of the cases was 26.2 years and that of control was 26.4 years. Forty (62.5%) were primigravida and 23 (37.5%) multigravida in both the groups. The period of gestation (POG) of 41 cases (64.06%) was between 37<sup>+1</sup> to 40 weeks and 23 cases (35.5%) between 40<sup>+1</sup> to 42 weeks in each group.

**Table 1. Outcome of induction in normal vs borderline AFI**

	Normal AFI N (%)	Borderline AFI N (%)	P value
Induced N (%)	23 (35.9%)	47 (73.4%)	0.00001
Induced vaginal delivery N (%)	15 (65.21%)	24 (51.06%)	0.1
Post induction emer- gency cesarean section N (%)	8 (34.7%)	23 (48.9%)	0.1
Indications of post induction emergency cesarean section			
Fetal distress	2 (25%)	16 (69.5%)	0.01 (OR = 1.1)
Non progression of labor	3(37.5%)	6(26.08%)	0.20
Others	3 (37.5%)	1 (4.3%)	0.02

Table 1 shows the outcome of induction and indications of post induction cesarean section. A significant number of cases in the borderline AFI group was induced as compared to those in the normal AFI group (73.4 % vs 35.9 %, p= 0.0001, OR = 4.9).

Post induction emergency cesarean section was done in 16 (69.5%) women with borderline AFI which was significantly higher than in women with normal AFI (2; 25%; p=0.01; OR 1.1).

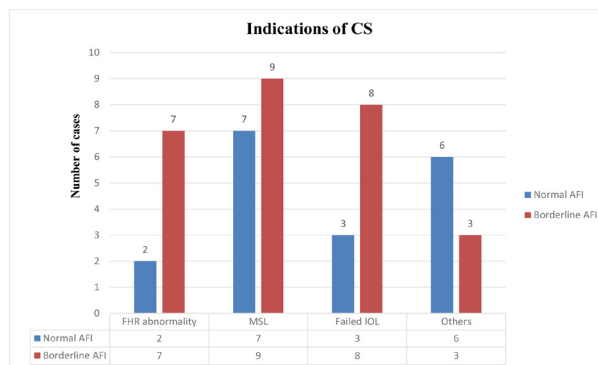
**Table 2. Mode of delivery**

Normal AFI ( n = 64)			Borderline AFI ( n = 64)			P value
VD N(%)	CS N(%)	Instrumental Delivery N(%)	VD N(%)	CS N(%)	Instru- mental Delivery N(%)	
46 (71.8)	18 (28.1)	0	37 (57.8)	27 (42.1)	0	0.04 OR=1.8

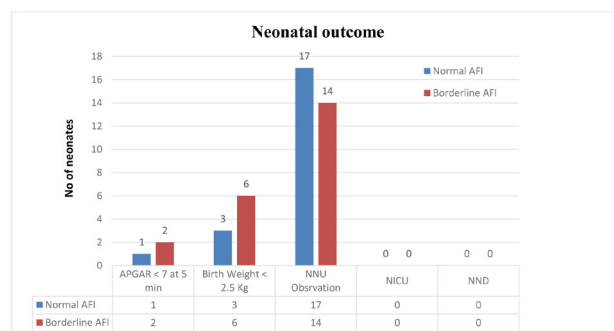
Table 2 shows the mode of delivery in 128 subjects. Statistical significance is seen in rate of cesarean section in the 2 groups (42.1% vs 28.1%, p = 0.04).

Figure 1 demonstrates the indications of cesarean section in the study subjects. Most common cause of cesarean section in both borderline AFI and normal AFI was meconium staining of liquor but with no statistical significance (33.3% and 38.3%, p = 0.3). Fetal heart rate abnormality was not found to be significantly different either (25.9% in borderline AFI vs 11.1%, in normal AFI; p =0.2).

Figure 2 represents the neonatal outcome. The rate of adverse neonatal outcomes was more in borderline than in normal AFI group in terms of APGAR score of < 7 at



**Figure 1. Indications of CS**



**Figure 2. Neonatal Outcome**

5 minutes (3.1 % vs 1.5%, p = 0.6) and low birth weight (9.1% vs 4.5%, p = 0.32) but none of these were statistically significant. The most common cause of neonatal transfer to NNU was tachypnoea which was statistically significant between the two groups (50% in borderline AFI vs 11.1% in normal AFI; p = 0.01).

## DISCUSSION

Amniotic fluid volume influences the fetal outcome and serves as an indicator of fetoplacental health status. The amniotic fluid index (AFI), proposed by Phelan and colleagues in 1987 is the most widely used sonographic method for estimating amniotic fluid volume.<sup>1</sup>

The current study aimed to evaluate this influence by comparing the obstetric intervention rate and neonatal outcome in term pregnancies with borderline AFI versus normal AFI. Specific objective of the study was to compare uncomplicated singleton term gestations having borderline AFI with those having normal AFI in terms of obstetric interventions, fetal intolerance to labor and neonatal outcome.

The baseline characteristics of both the groups of population was matched in terms of maternal age, gestational age and parity and were found to be similar in these aspects. In this study statistically significant rate of induction of labor (73.4% vs 35.9%, p = 0.0001, OR = 4.9) was observed consistent with some other studies.<sup>10,11</sup> Further analysis of outcome of induction of labor showed that achieving vaginal delivery post induction was more in normal AFI group than in the borderline AFI group

(65.21% vs 51.06%). Post induction CS rate was 48.09% in borderline AFI group and 69.5% of these CS was for fetal distress which shows that borderline AFI fetuses have poor tolerance to induction of labor. These factors are directly explained by the effect of uterine contraction and asphyxia in the presence of reduced liquor.<sup>12</sup>

The rate of cesarean section was significantly more in borderline than in normal AFI group (42.1 % vs 28.1%,  $p = 0.04$ , OR = 1.8). Our rate of cesarean section was higher than that shown in other studies.<sup>11,8</sup> Although fetal distress was most common indication, partly earlier intervention in the form of induction of labor led to failed induction and non-progression of labor as reported by the study of Bushra et al. Tachycardia was seen to be more common in borderline AFI than in normal AFI group (25.9% vs 11.1%) but it was not significant statistically.<sup>13</sup> Meconium staining of liquor occurred more frequently in women with normal AFI (38.3% vs 33.3%). This could be because, some common causes of induction in the normal AFI group were reduced fetal movement and clinical IUGR which are independent risk factors for fetal meconium staining even when the AFI is normal.<sup>14</sup> Similarly the study of Kwon and Ulker also found that caesarean delivery for fetal distress was more in borderline oligohydramnios group.<sup>15,16</sup> So, the presence of borderline oligohydramnios should alert the obstetrician for risk of fetal distress warranting increased antepartum surveillance.

Regarding perinatal outcome only 3.1% of the neonates born to women with borderline AFI had APGAR score of < 7. Even though more babies in borderline AFI had birth weight < 2.5 kg (9.6% vs 4.6%,  $p = 0.3$ ) the difference between the two groups was not significant. Banks found twofold increase in the incidence of adverse perinatal outcomes while Jamal and Yaqoob et al.<sup>17-19</sup> in their separate researches reported no significant adverse perinatal outcomes with borderline AFI.

There was no NICU admission or NND. In our institution babies, who need special care but are not too sick to require intubation, critical care or invasive procedures, are admitted in NNU for observation and supportive treatment. Among babies born to pregnant women having borderline AFI 21.8% were transferred to NNU ( $p = 0.53$ ). Analysis of cause of transfer showed that 50% of the transfer in this group was tachypnea ( $p = 0.01$ , OR = 1.2). Other causes of transfer were nasal flaring, grunting, hypothermia and low birth weight. Unlike several studies showing adverse neonatal outcomes the ultimate neonatal outcome as indicated by NND was excellent in our study.<sup>15,20,21</sup> Limitations of the study were that randomization was not done and sample size was not large enough to draw appropriate conclusion.

## CONCLUSION

Timely intervention is very crucial in women when borderline AFI is detected in uncomplicated term pregnancies to bring about a good neonatal outcome and to reduce NICU admission and perinatal mortality. Intrapartum fetal monitoring should be very vigilant when women having borderline AFI have been induced. Detection of intrapartum fetal intolerance might appear to increase the maternal cesarean section rate and hence morbidity but the overall fetal outcome improves.

## ACKNOWLEDGEMENT

I sincerely thank Shital Bhandari, Associate Professor at Patan Academy of Health Sciences, Patan Hospital for his help in statistical analysis and all the participants of the study who made this work successful.

## REFERENCES

- Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman B, Casey BM. Williams Obstetrics, 25 ed. New York:Mc Graw Hill, 2018.
- Magann EF, Chauhan SP, Hitt WC, Dubil EA, Morrison JC. Borderline or marginal amniotic fluid index and peripartum outcomes: a review of the literature. *Journal of Ultrasound in Medicine*. 2011 Apr;30(4):523-8.
- Giri A, Srivastav VR, Tuladhar AS, Sharma B. Perinatal outcome of term pregnancies with borderline amniotic fluid index at Nepal Medical College and Teaching Hospital. *Nepal Med Coll J*. 2015;17(1-2):63-6.
- Gumus II, Kokterer A, Turhan NO. Perinatal outcomes of pregnancies with borderline amniotic fluid index. *Archives of gynecology and obstetrics*. 2007 Jul 1;276(1):17-9.
- Nabhan AF, Abdelmoula YA. Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. *Cochrane Database of Systematic Reviews*. 2008(3).
- Agrawal S, Agrawal V, Yadav S. Comparative study of amniotic fluid index in normal and high risk pregnancy complicated by PIH. *Ind J Obst Gynaecol Res*. 2015;2: 242-5.
- Wing DA, Fishman A, Gonzalez C, Paul RH. How frequently should the amniotic fluid index be performed during the course of antepartum testing? *American journal of obstetrics and gynecology*. 1996 Jan 1;174(1):33-6.
- Choi SR. Borderline amniotic fluid index an perinatal outcomes in uncomplicated term pregnancy. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2016;29(3):457-60.
- Wood SL, Newton JM, Wang L, Lesser K. Borderline Amniotic Fluid Index and Its Relation to Fetal Intolerance of Labor: A 2-Center Retrospective Cohort Study. *Journal of Ultrasound in Medicine*. 2014 Apr;33(4):705-11.
- Asgharnia M, Faraji R, Salamat F, Ashrafkhani B, Heirati SF, Naimian S. Perinatal outcomes of pregnancies with borderline versus normal amniotic fluid index. *Iranian journal of reproductive medicine*. 2013 Sep;11(9):705-10.
- Petrozella LN, Dashe JS, McIntire DD, Leveno KJ. Clinical significance of borderline amniotic fluid index and oligohydramnios in preterm pregnancy. *Obstetrics and Gynecology*. 2011 Feb 1;117(2):338-42.

12. James D, Steer PJ, Weiner CP, Gonik B, Crowther CA, Robson SC. High risk pregnancy. Fourth edition, China, Elsevier. 2011.
13. Bushra N, Zeeshan K, Ejaz S, Mushtaq J, Waheed K, Khanum A. Frequency of Caesarean Section in Pregnancies with Borderline Amniotic Fluid Index at Term. *Annals of King Edward Medical University*. 2017 Jun 6;23(2):158-61.
14. Raman RTS, Jayaprakash DG. Neonatal outcome in meconium stained deliveries- a prospective study. *Medical Journal Armed Forces India*. 1997 Jan 1;53(1):15-8.
15. Kwon JY, Kwon HS, Kim YH, Park YW. Abnormal Doppler velocimetry is related to adverse perinatal outcome for borderline amniotic fluid index during third trimester. *Journal of obstetrics and gynaecology research*. 2006 Dec;32(6):545-9.
16. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid volume: I. The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome. *American journal of obstetrics and gynecology*. 1984 Oct 1;150(3):245-9.
17. Banks EH, Miller DA. Perinatal risks associated with borderline amniotic fluid index. *American journal of obstetrics and gynecology*. 1999 Jun 1;180(6):1461-3.
18. Jamal A, Abbasi S, Mesdaghinia S. OP23. 09: Borderline amniotic fluid index and adverse perinatal outcome. *Ultrasound in Obstetrics and Gynecology*. 2008 Aug;32(3):391
19. Yaqoob S, Iqbal R. Relation between borderline amniotic fluid index and perinatal outcome. *PJMHS*. 2009;3(4):361-4.
20. Ghike S, Reddy G, Ghike NW. Increasing severity of oligohydramnios: A risk factor for outcome. *J South Asian Feder Obst Gynecol*. 2013 Jan;5(1):8-10.
21. Hashimoto K, Kasdaghi T, Sharoky C, Jain S, Turan S, Atkins K, et al. Perinatal outcome of mildly decreased AFI in third trimester. *Ultrasound in Obstetrics and Gynecology*. 2011;38(S1):53.