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## Comparison of Perinatal Outcomes between Borderline and Normal Amniotic Fluid Index in Term Singleton Pregnancies

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### ABSTRACT

**Background:** Amniotic fluid provides necessary fluid and growth factors for normal development of fetal lungs, cushions the umbilical cord from compression and protects the fetus. This study aims to compare the perinatal outcome between pregnancy with borderline and normal Amniotic Fluid Index that provide greatest chance for appropriate safe delivery with least maternal fetal and neonatal risk.

**Methods:** A total of 94 singleton full term pregnant women were included in the study-at Kathmandu Model Hospital from February to August 2020. Forty Seven women each with Amniotic Fluid Index 5-8 cm was taken as borderline oligohydramnios group and Amniotic Fluid Index 8.1-24 cm was taken as normal group. Ultrasonography was taken as the medium for measuring Amniotic Fluid Index.

**Results:** The rate of intra-partum fetal distress, meconium-stained amniotic fluid, low birth weight and neonatal intensive care unit admission were not statistically significant between the two groups while rate of cesarean section was noted to be 76.6% in exposed groups as compared to 44.7% among women with non-exposed normal group [RR=1.71; 95%CI: 1.2-2.44 p=0.006].

**Conclusions:** We concluded that in cases of borderline oligohydramnios there was higher risk of operative delivery.

**Keywords:** Adverse perinatal outcome; amniotic fluid; borderline oligohydramnios; meconium-stained amniotic fluid

### INTRODUCTION

Amniotic fluid volume (AFV) is determined by ultrasound. Commonly used method is the Amniotic Fluid Index (AFI) which is calculated by adding the depths in centimeters of largest vertical pockets in each of four equal uterine quadrants and normal range is 8-24 cm. Borderline oligohydramnios a sonographic estimate of amniotic fluid volume, AFI of 5.1 to 8 cm.<sup>1-5</sup>

Oligohydramnios complicates approximately 1-2% of pregnancies. Etiology includes fetal congenital anomalies, rupture of membranes, intrauterine growth retardation, post term pregnancy and uteroplacental insufficiency. Decreased AFV is a predictor of poor fetal tolerance of labor and is associated with increased risk of fetal distress and operative delivery, preterm delivery, low birth weight, low APGAR score, and neonatal intensive care unit admission (NICU).<sup>6</sup> Giri et al<sup>7</sup> quoted the incidence of borderline oligohydramnios to be 7.7%

The rate of cesarean section was noted to be 33% in borderline oligohydramnios group as compared to 17% among women with normal liquor. The major objective of this study was to compare the perinatal outcome of borderline oligohydramnios with normal AFI at term.

### METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynecology for six months from 15 February to 15 August, 2019. A sample size of 47 was calculated using the formula for two proportions, using prevalence of low birth weight from previous study by Asgharnia and colleagues, where 47% in borderline oligohydramnios patients and 20 % in normal AFI patients was noted.<sup>22</sup>

Patients aged 18-35 years with gravidity >1, singleton full term pregnancy with cephalic presentation, intact amniotic membrane were included in the study group via

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consecutive non-probability sampling. Delivery within two weeks of AFI measurement was necessary. Patients with AFI 5-8 cm were taken as exposed group and AFI 8.1-24 cm were taken as non-exposed group. Since the patients included in the study were all admitted in the hospital, there were no lost to follow up, or drop outs. Patients with maternal medical and surgical diseases like pregnancy induced hypertension, eclampsia, gestational diabetes, antepartum hemorrhage, fetal anomalies, prior cesarean delivery and with absolute contraindication for vaginal delivery were excluded from the study.

Approval from the Institutional Review Committee (IRC) of pfect-NEPAL was obtained and study was conducted at Kathmandu Model Hospital. Patients meeting the inclusion criteria were selected for the study and enrolled from labor room. Informed written consent was taken after explaining about the purpose, risk and benefit of the study. Then, brief history taking and relevant examination were done. The expected date of delivery and gestational age were calculated from her last menstrual period and confirmed by USG wherever applicable. USG was taken as the investigation of choice for measuring and the scan taken within two weeks of hospital admission was considered for the study. USG done at Kathmandu Model Hospital was only taken into account. Any obstetric complication, prior to and at the time of admission or during her stay in hospital and any intervention done was recorded. Patients were managed according to the hospital protocol for normal course of labor for vaginal delivery or cesarean section as obstetrically indicated. The delivery was attended in majority of cases by the researcher, and in a few deliveries which could not be attended; the information was collected from the medical records. Mode of delivery whether spontaneous vaginal, elective or emergency cesarean section was noted. Indication of cesarean section was noted. The adverse perinatal outcomes studied were intra partum fetal distress, presence of meconium stained liquor during labor and delivery, low birth weight, and admission to NICU. Data was collected using a proforma for each patient recruited for the study.

Data analysis was done using Statistical Package for Social Science (SPSS) version 22.0. Statistical analysis was done with appropriate method. Quantitative variables like age of women, gestational age, height, weight, body mass index (BMI) birth weight was computed for mean and standard deviation, and compared within groups using Independent T test. Qualitative variables like parity, meconium-stained liquor, mode of delivery, NICU admission was compared within two groups using Chi-square test. Relative risk (RR) was calculated. Furthermore, confounders like age, parity, BMI,

occupation, educational status and effect modifiers like smoking status was dealt through stratification. Post stratification chi Square test was applied and Relative Risk was calculated to see the strength of association between borderline oligohydramnios and adverse perinatal outcome.

## RESULTS

A total of 94 singleton pregnant women with full term pregnancy were included according to AFI. Forty-Seven women with AFI 5-8 cm was taken as exposed group and AFI 8.1-24 cm was taken as non-exposed group. The mean ages were 27.81±4.09 years and 27.55±4.68 years in the exposed and the un-exposed groups. Demographic characteristics of the patients between groups are shown in Table 1.

Table 1. Comparison of Demographic characteristics between groups (n=94).

Variables	Exposed n=47	Unexposed n=47	p-value
Age(years)	27.81±4.09	27.55±4.68	0.77
Gestational age at admission (weeks)	38.40±0.83	38.89±0.89	0.007
Weight (kg)	71.02±7.57	72.74±8.25	0.294
Height (cm)	159.39±4.07	161.24±3.93	0.029
BMI (kg/m <sup>2</sup> )	33.42±37.59	31.03±20.25	0.24

Independent sample t test used

Table 2. Comparison of fetal parameters between groups (n=94).

Variables	Exposed n=47	Unexposed n=47	p-value
Height of uterus (cm)	35.78±1.63	36.16±2.17	0.342
EFW (gms)	2792.70±412	2954.76±276	0.027*
Birth weight (gms)	2957.44±427	3206.80±329	0.002*
FHR (b/min)	146.04±10.35	147.74±9.88	0.417
Apgar score at 1 min	7.06±0.44	6.97±.15	0.209
Apgar score at 5 min	8.08±0.35	7.97±0.15	0.058

Independent sample t test used \*significant, FHR= Fetal heart rate; AFI= Amniotic fluid index; EFW= Estimated Fetal Weight

All women were married. There were 42 (44.7%) primiparous women had and 52 (55.3%) multiparous. Out of 94, history of abortion was observed in 25(26.6%) women and history of still birth was found in five

cases. Parity, occupation status and education were not statistically significant between the groups. Three women in un-exposed group were smoker. Mean height of uterus, AFI, estimated fetal weight (EFW), birth weight, fetal heart rate, Apgar score at 1 and 5 minutes are also reported in Table 2.

Association of oligohydramnios at term with adverse perinatal outcome is presented in Table 3. Rate of low birth weight, intra-partum fetal distress, meconium-stained amniotic fluid and NICU admission were not statistically significant between exposure and non-exposure groups while rate of cesarean section was

noted to be 76.6% in exposed groups as compared to 44.7% among women with non-exposed group [RR=1.71; 95%CI: 1.2-2.44 p=0.006]. Most of the indication of caesarean section was Non Progress of Labor (NPOL) maternal request and fetal distress (Table 4).

Age ( $\leq 30$ ,  $> 30$  years), parity (primi and multi), BMI ( $< 28$  and  $\geq 28$ kg/m<sup>2</sup>), occupation (in jobs, house-wife) and education (primary/secondary, graduate/above) were stratified and effect was observed in association between oligohydramnios at term with adverse perinatal outcome.

**Table 3. Association of oligohydramnios at term with Adverse perinatal outcome.**

Adverse perinatal outcome	Exposed (n=47)	Unexposed (n=47)	Total (n=94)	p-Value	RR [95%CI]
<b>Low Birth Weight (<math>\leq 2500</math> gm)</b>					
Yes	8(17.2%)	2(4.3%)	10(10.6%)	0.091	4.00 [0.89-17.82]
No	39(83%)	45(95.7%)	84(89.4%)		
<b>Intra partum fetal distress</b>					
Yes	10(21.3%)	13(27.7%)	23(24.5%)	0.472	0.77 [0.37-1.58]
No	37(78.7%)	34(72.3%)	71(75.5%)		
<b>Meconium stained amniotic fluid</b>					
Yes	4(8.5%)	8(17%)	12(12.8%)	0.216	0.50 [0.16-1.55]
No	43(91.5%)	39(83%)	82(87.2%)		
<b>NICU admission</b>					
Yes	10(21.3%)	8(17%)	18(19.1%)	0.600	1.25 [0.54-2.88]
No	37(78.7%)	39(83%)	76(80.9%)		
<b>Mode of delivery</b>					
Cesarean Section*	36(76.6%)	21(44.7%)	57(60.6%)	0.006	1.71† [1.20-2.44]
Instrument Delivery	1(2.1%)	1(2.1%)	2(2.1%)		
Vaginal Delivery	10(21.3%)	25(53.2%)	35(53.2%)		

† For computational of relative risk for mode of delivery we summed instrumental and vaginal delivery. RR= relative Risk CI=Confidence Interval; [\*Elective C/S =36 Emergency, C/S=21]

**Table 4. Indication of Cesarean section according to groups.**

Indication of Caesarean Section	Exposed (n=36)	Unexposed (n=21)	Total (n=57)
Maternal Request	9(25%)	3(14.3%)	12(21.1%)
Fetal Distress	3(8.3%)	4(19%)	7(12.3%)
Intrauterine Growth Restriction (IUGR)	2(5.6%)	0(0%)	2(3.5%)
Fibroid uterus	2(5.6%)	0(0%)	2(3.5%)
Subfertility treated	1(2.8%)	1(4.8%)	2(3.5%)
Pre-labor Rupture of membrane (PROM)	1(2.8%)	1(4.8%)	2(3.5%)
Non progress of labor (NPOL)	10(27.7%)	7(33.3%)	17(31.4%)
Failed induction	1(2.8%)	2(9.5%)	3(5.3%)
Bad Obstetric History	2(5.6%)	0(0%)	2(3.5%)
Arrest in 2nd stage of labor	3(8.3%)	2(9.5%)	5(8.7%)
Others	2(5.6%)	1(4.8%)	3(5.3%)

## DISCUSSION

Amniotic fluid is in the amniotic sac of human gravid female which surrounds the baby like a shock absorber or a like a cushion. It also allows fetal breathing and movements. The circulation of it is by production of urine and swallowing by the fetus. The amniotic fluid volume changes with the gestational age; it is 200 ml at 16 weeks, 1000 ml at 28 weeks, 900 ml at 36 weeks and 800 ml at 40 weeks of gestation.<sup>8</sup> An experienced obstetrician can assess oligohydramnios on clinical examination; however it should be confirmed by ultrasound. The amniotic fluid index (AFI) is normal in the range 8-24, borderline 5-8, and <5 is diagnosed as oligohydramnios.<sup>9,10</sup> Oligohydramnios is associated with intrauterine growth restriction, congenital anomaly, neonatal and maternal morbidities. There should be antenatal fetal surveillance and neonatal facilities where these women plan to deliver. The outcome for cases of decreased liquor that falls short of the diagnostic criteria for oligohydramnios is less clear.<sup>11-13</sup>

In this study average age was 27.81±4.09 years and 27.55±4.68 years in exposed and un-exposed groups. In a prospective comparative study by Giri et al, the incidence of borderline oligohydramnios was noted to be 7.7 % with mean maternal age of 24.9 years.<sup>7</sup>

The association of a borderline amniotic fluid index with adverse perinatal outcomes has been described and the occurrence of maternal and fetal complications was reported more often in pregnancies with borderline AFI than in those with normal AFI.<sup>14,15</sup> Borderline AFI cases had higher rate of neonatal complications such as Apgar score of less than 7, IUGR, LBW, and crucial need to NICU. Petrozella et al<sup>16</sup> reported the rate of caesarean 24% and the birth weight below the third percentile 21%. Voxman et al<sup>15</sup> reported NICU admission among women with borderline AFI that were almost similar to our results. This study further corroborates the findings.

In the present study there was significantly increase rate of cesarean section was noted to be 76.6% in exposed groups as compared to 44.7% among women with non-exposed groups [p=0.006]. Petrozella et al<sup>16</sup> reported the rate of caesarean 24% and the birth weight below the third percentile 21%; or Banks considered the likelihood of IUGR up to 4 times greater, and Gumus et al found a higher rate of IUGR, LBW, Apgar score of less than 7 at 5 minutes, and NICU admission among women with borderline AFI which were in accordance to our results.<sup>16,17</sup>

In a study by Pandey and colleague<sup>18</sup> 51% cases were

delivered by cesarean section while 45% cases were delivered by spontaneous vaginal delivery, only 3% cases were delivered by instrumental vaginal delivery, (p=0.02). Findings indicated that maternal outcomes such as preterm delivery and labor induction in women with borderline AFI were considerably higher than those in normal group and that was consistent with the findings in some other studies with the same results.<sup>16,17,19</sup> Many studies have been done to show the association of a borderline amniotic fluid index with some adverse perinatal outcomes and, in most findings, the occurrence of maternal and fetal complications was reported more often in pregnancies with borderline AFI than in those with normal AFI.<sup>17,19</sup>

The present study showed rate of low birth weight, intra-partum fetal distress, meconium-stained amniotic fluid and NICU admission were not statistically significant between exposure and non-exposure groups. In a study by Gumus et al<sup>20</sup> and Voxman et al<sup>15</sup> the groups were similar with respect to maternal age, gravidity and parity.

In our institution, infants with Apgar less than 7 at 1 and 5 minute are routinely observed in the NICU after delivery and this may contribute to the higher rate of admission in NICU. Therefore, because of the fact that the findings in this study reinforces the increased pregnancy complications in women with borderline AFI, and because of the lack of a definite care protocol to care the patients, the physicians recommend that the patients have twice weekly sonography assessment to evaluate AFI and to permanently monitor the patients for IUGR and SGA and to take all necessary measures in order to avoid adverse perinatal complications.<sup>14,21</sup> Further studies are warranted to confirm the effect of AFI on pregnancy outcome.

Many studies have been done to show the association of a borderline amniotic fluid index with some adverse perinatal outcomes and, in most findings, the occurrence of maternal and fetal complications was reported more often in pregnancies with borderline AFI than in those with normal AFI.<sup>14,16</sup> Since this study took place in a small private hospital, a greater number of sample size was not able to be incorporated for wider results.

## CONCLUSIONS

In this study rate of low birth weight, intra-partum fetal distress, meconium stained amniotic fluid and NICU admission were not statistically significant between exposure and non-exposure groups while rate of cesarean section was noted to be 76.6% in exposed