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Original Research Article

## A clinical study evaluating maternal and perinatal outcomes in patients with decreased amniotic fluid in term pregnancy

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### ABSTRACT

**Background:** Oligohydramnios is the most frequent third trimester complication resulting in a greater number of caesarean sections. This study was carried out to determine the role of oligohydramnios (AFI<5) and borderline amniotic fluid index (AFI between 5.1-8) for term pregnancy and their impact on maternal and perinatal outcomes. Objectives of current investigation were to study incidence of oligohydramnios in term pregnancy and to study maternal and perinatal outcome in cases with oligohydramnios.

**Methods:** Present study is done during August 2018 to May 2019 in department of obstetrics and gynaecology, northern central railway hospital, Delhi on 90 women with singleton term pregnancy (37-41weeks) with cephalic presentation, with no leaking PV. According to the AFI measurements (1 week before delivery), 3 groups were formed AFI 0-5 cm (oligohydramnios), 5.1-8cm (borderline AFI), 8.1-24 cm (normal AFI), AFI >24 cm was excluded. Maternal and fetal outcome were assessed.

**Results:** The incidence of oligohydramnios (AFI<5 cm) was 4.4%. Induction of labour was 50% in AFI <5 cm group, 57.1% in borderline AFI and 13.9% in normal AFI group. In AFI <5 cm group, 75% had LSCS, in AFI 5-8 cm group, 71.42% had LSCS. Most common indication of LSCS in AFI <5 cm and AFI 5-8 cm was fetal distress. APGAR score <7 at 1, 5 mins was 50% in AFI <5 cm and AF 5-8 cm group as against 8.9% in Normal group. Babies weighing less than 2.5kg were 50% in AFI <5cm group, 42% in borderline group and 15.1% in normal AFI group.

**Conclusions:** AFI determination helps to identify foetuses at risk of poor perinatal outcome. It is a valuable screening test to predict fetal distress in labor that may need caesarean section.

**Keywords:** AFI, Borderline AFI, Oligohydramnios

### INTRODUCTION

Amniotic fluid surrounds the developing fetus in amniotic sac that provides many benefits to the fetus. It creates a physical space for fetal movements, which is necessary for normal musculoskeletal development. It permits fetal swallowing which is essential for gastrointestinal development, and fetal breathing necessary for lung development. It guards against umbilical cord compression and protects the fetus from trauma. It also has bacteriostatic properties.<sup>1</sup> It

increases rapidly in first half of pregnancy, and reaches 800-1000 ml at 37 weeks, 700-800 ml at 40 weeks. After 40 weeks amniotic fluid starts decreasing at rate of 8 % per week, amounting to 400-500 ml at 42 weeks, 250 ml at 43 weeks and 160 ml at 44 weeks.<sup>2</sup> Phelan et al, Baron et al and Kwon et al defined oligohydramnios as AFI less than or equal to 5 cm and 5.1 to 8 as Borderline or marginal oligohydramnios.<sup>3-5</sup> Oligohydramnios is the most frequent third trimester complication resulting in a greater number of caesarean sections mainly due to maternal and fetal

risks. Regular antenatal checkups, timely screening for AFI, with proper management helps to reduce unnecessary maternal and fetal morbidity.<sup>6</sup> Several previous studies have shown increased adverse pregnancy outcomes like meconium-stained liquor fetal distress, low APGAR score, increased rates of induction of labour, caesarean section for fetal distress, increased perinatal morbidity and mortality in cases of oligohydramnios. However, some of the studies have shown that amniotic fluid index is a poor predictor of adverse outcome of pregnancy and even the existence of conditions like isolated term oligohydramnios has been questioned few by authors. This study was carried out to determine the role of oligohydramnios (AFI <5 cm), borderline amniotic fluid intake (AFI between 5.1-8 cm) for term pregnancy and their impact on maternal and perinatal outcomes.

## METHODS

Present study is a hospital-based study and was done over a period August 2018- May 2019 in the department of obstetrics and gynecology, northern central railway hospital, New Delhi on 90 women with singleton term pregnancy (37-41 weeks) attending the department.

### *Inclusion and exclusion criteria*

Inclusion criteria for current study were; patients with gestational age 37-41 weeks, singleton gestation with cephalic presentation and patients with no complaints of leaking per vaginam. Exclusion criteria for current study were; less than 37 weeks, multiple gestation/known uterine anomalies patient with PROM, AFI > 24 cm.

### *Sample size*

With reference to the study conducted by Bachhav et al current study sample is calculated as follow using following formula; where prevalence of oligohydramnios at term <5% (put reference number) (p=46), so  $q=100-p=100-46=54$ .<sup>13</sup>

$$N = 4 p q / L^2$$

So minimum 76 samples were needed and we have included 90 samples in this study.

Patients with singleton term pregnancy (37-41 weeks) with cephalic presentation, with no complaints of leaking PV, without known uterine anomalies, sure about dates and/or an obstetric ultrasound in first trimester of pregnancy and having AFI measurement within one week of delivery were included in the study. Pregnancy associated with less than 37 weeks, multiple gestation, premature rupture of membranes were excluded. A detailed history and examination were done. By using Phelan method, amniotic fluid volume was measured with four quadrant technique which consist of measuring the largest pool of fluid devoid of cord and fetal parts,

found in each of the four quadrants of uterus. The sum of all the measurements gives AFI. If the woman will not deliver within 7 days of ultrasound, a repeat ultrasound for measuring AFI will be done.<sup>4</sup> According to the measurements of AFI, four groups will be formed AFI 0 to 5 cm (oligohydramnios), 5.1 to 8 cm (borderline AFI), 8.1 to 24 cm (normal AFI), women with an AFI >24 cm will be excluded from this study. Gestational age at the time of delivery and the onset of delivery were recorded. Delivery mode either vaginal or cesarean section were also noted. Indication for cesarean section were kept in record along with any complications during the operation. Color of the liquor at the time membrane ruptured were recorded. Neonate whether still birth or alive were recorded. If alive, the birth weight at the time of delivery with APGAR score at 1 minute and 5 minutes were observed and noted. Birth weight less than 2.5 kg considered as low birth weight. Neo-natal complication if any like respiratory distress syndrome, meconium aspiration or others were also recorded. Any resuscitation required just after delivery were noted. Maternal outcome were assessed by gestational age at the time of delivery, onset of labour (spontaneous/ induced), AFI at the time of latest ultrasound, mode of delivery, incidence of LSCS, indication of LSCS, incidence of MSAF. Fetal outcomes were assessed by live birth/still birth, baby weight at the time of birth. According to APGAR score at 1 Min, 5 minutes, congenital abnormality, if present, Neonatal complications if any, Incidence of NICU admission, Indication for NICU admission. All the values were calculated by One-way ANOVA test, Chi-Square test and post bon-ferroni test.

## RESULTS

A prospective observational study was carried out on 90 pregnant women between 37-41 weeks of gestation during the time period of August 2018 to May 2019 and results analyzed. The mean age of the study population was 27.64 years. In present study, incidence of oligohydramnios (AFI <5 cm) was 4.4%. In group with AFI <5 cm, there were 4 patients. In borderline AFI group, there were 7 patients and 79 patients in normal AFI group. Most patients in the study belong to the age group of 26-30 years. The mean age of mother was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI using the one-way ANOVA test. There was no significant difference in mean age of mother. Most of the patients were multiparous in this study, 57.3% in this study were multiparous and 42.7% in this study were primigravida. This difference was found to be non-significant. In our study population, mean gestational age at USG examination for AFI measurement is shown in (Table 1). Most pregnancies in group AFI 0-5 cm were delivered by 39 completed weeks. In group of 5-8 cm, most pregnancies were delivered by 40 completed weeks. In rest patients, most pregnancies were delivered by 41 completed weeks. Comparatively more pregnancies were terminated earlier in oligohydramnios and borderline AFI group. Mode of delivery in our study population with AFI

<5 cm rate of induction was 50%, in the group of 5.1 to 8cms the rate of induction of labour was 57.1 %, the rate of induction in group of AFI 8.1 to 24 cm was 13.9%.

**Table 1: Comparison of gestational age in different AFI groups.**

Period of gestation (weeks)	Number of patients in each group			
	0-5 cms	5-8cms	8-24 cms	Total
37-37.6	2	1	7	10
38-38.6	1	3	21	25
39-39.6	0	1	30	31
40-40.6	0	1	14	15
>41	1	1	7	9
<b>Total number of patients in each group</b>	<b>4</b>	<b>7</b>	<b>79</b>	<b>90</b>

**Table 2: Comparison of mode of delivery among AFI groups.**

Parameters	AFI		
	≤5.0	5.1-8.0	8.1-24.0
Spontaneous, N (%)	2	2	62
	50	28.57	78.48
Induced, N (%)	2	4	11
	50	57.14	13.92
Elective LSCS, N (%)	0	1	6
	0	14.28	7.59
<b>Chi-square=12.994, p value=0.011</b>			
FTND/Instrumental delivery/VBAC, N (%)	1	2	48
	25	28.57	60.75
LSCS, N (%)	3	5	31
	75	71.42	39.24
Total, N (%)	4	7	79
	100.0	100.0	100.0
<b>Chi-square value=3.290, p value=0.915</b>			

**Table 3: Indications of LSCS among AFI groups.**

Indications of LSCS		<5	8-24 cms	5-8 cms	Total
Indication of LSCS	AFI at the time of latest ultrasound	<5	8-24 cms	5-8 cms	
	FTND/instrumental delivery	1	48	2	51
	Failed induction	1	5	2	8
	Fetal distress	2	7	3	12
	Macrosomic baby	0	1	0	1
	Non progress of labour	0	11	0	11
	Prev. LSCS with NPOL	0	1	0	1
	Prev. 2 LSCS with scar tenderness	0	1	0	1
	Prev. LSCS with CPD	0	1	0	1
	Prev. LSCS with postdatism	0	1	0	1
	Prev. LSCS with RH NEG pregnancy	0	1	0	1
	Prev. LSCS with RH negative with preclampsia	0	1	0	1
	Prev. LSCS with scar tenderness	0	1	0	1
	<b>Total</b>	<b>4</b>	<b>79</b>	<b>7</b>	<b>90</b>

It shows that rate of induction of labour increases with decreased liquor. The onset of labour was compared in normal, borderline and severe AFI groups using the chi-square test. Emergency LSCS was found to be significantly more among subjects with AFI <5 cm.

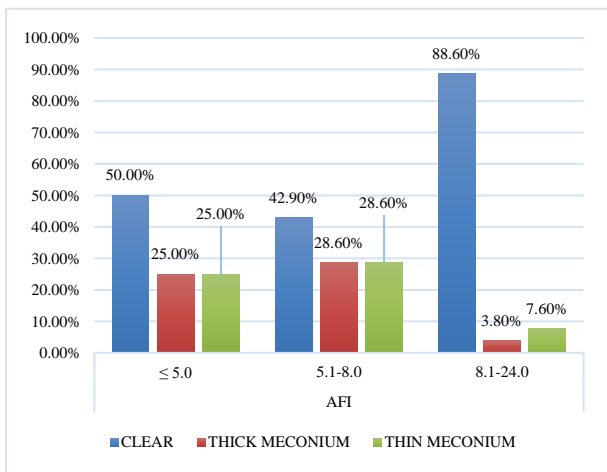
Induced labour was found to be significantly more among subjects with borderline AFI and severe AFI group as compared to normal AFI group. The rate of Emergency LSCS was 75% in group with AFI <5 cm, 71.42 % in group with AFI (5.1-8 cm), and 39.24% in group with

AFI 8.1 to 24 cm, it shows that chances of emergency LSCS increase with decreased liquor as shown in (Table 2). In present study, 66.66% patient had LSCS due to fetal distress in AFI group 0-5 cm as shown in (Table 2), 42.9 % patient had LSCS due to fetal distress in AFI group 5- 8 cm as shown in table 3, compared to AFI 8-24 cm in which 7.6% LSCS were due to fetal distress., which was statistically significant. Fetal distress was significantly more among  $\leq 5.0$  AFI. Thick meconium and thin meconium was significantly more among  $\leq 5.0$  and 5.1-8.0 AFI as shown in (Figure 1).

The mean birth weight was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI using the one-way ANOVA test. There was a significant difference in mean birth weight between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI. The mean birth weight was significantly more among 8.1-24.0 AFI compared to  $\leq 5.0$  AFI as seen in (Table 4).

**Table 4: Mean birth weight in different AFI groups.**

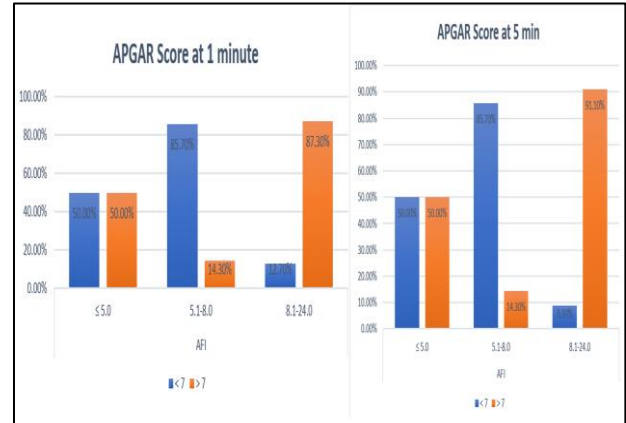
AFI	Birth weight			F value	P value
	Mean (kg)	SD			
$\leq 5.0$	2.78	0.59			
5.1-8.0	2.50	0.37	3.308	0.041	
8.1-24.0	2.95	0.46			



**Figure 1: Comparison of nature of amniotic fluid among AFI groups.**

The distribution of APGAR score at 1 minute was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI APGAR score at 1 minute  $<7$  was significantly more among  $\leq 5.0$  AFI. The distribution of APGAR score at 5 minutes was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI using the Chi-square test. APGAR score at 5 minutes  $<7$  was significantly more among  $\leq 5.0$  AFI. NICU admission in our study among AFI 0-5 cm=75%, AFI 5-8 cm=42.9 %, AFI 8-24 cm= 8.9%, This was statistically significant. The distribution of NICU admission was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI using the Chi-square test. NICU admission was significantly more among severe oligohydramnios and

borderline oligohydramnios group. In this study, 3 neonates among AFI Group 0-5 cm went to NICU out of which 2 were admitted due to respiratory distress and 1 was admitted in view of IUGR. In AFI group 5-8 cm, 2 were admitted due to respiratory distress in neonate. IUGR and Respiratory distress were common indications in oligohydramnios and borderline AFI group. IUGR was significantly more among  $\leq 5.0$  AFI. The distribution of final outcome was compared between  $\leq 5.0$ , 5.1-8.0 and 8.1-24.0 AFI using the Chi-square test. IUGR was significantly more among  $\leq 5.0$  AFI.



**Figure 2: Comparison of APGAR score at 1 and 5 minutes among AFI groups.**

**DISCUSSION**

In present study, incidence of oligohydramnios (AFI  $<5$  cm) was 4.4% (N=4). Oligohydramnios occurs in about 1-5% of pregnancies at term as stated by Moore IR<sup>6</sup> in his study. In this study, mean maternal age was 27.41 years (one-way ANOVA test, p value=0.895), maximum number of women were in age group 26- 30 years and can be compared to the study by Chauhan et al wherein the mean maternal age was 23-29 yrs.<sup>12</sup> There was no significant correlation of maternal age with AFI.

In present study, among group with AFI  $<5$  cms, primigravida were 44.4% and multigravida were 55.6%, among borderline AFI group, primigravida were 54.5% and multigravida were 45.5% whereas in study by Suvarna et al primigravida were 27% and multigravida were 73%.<sup>7</sup> There was no significant correlation of parity with AFI. Patients with oligohydramnios (AFI  $<5$  cm) and borderline AFI (5.1-8 cm) were terminated earlier as compared with normal AFI. In study conducted by Casey et al 42% were induced and in present study 50% (Chi-square=12.994, p value=0.011) of the patients were induced.<sup>11</sup>

In our study population, among patient with oligohydramnios (AFI 0-5 cm), 75% (Chi-square value=3.290, p value=0.915) underwent emergency LSCS, while amongst Borderline AFI (5-8 cm), 71.42% underwent emergency LSCS compared to normal AFI

group in which 39.24% percent had emergency LSCS and is comparable with the study by Suvarna et al and

Gupta et al as shown in (Table 10).<sup>7,8</sup> This was statistically significant.

**Table 5: APGAR score at 1 minute and 5 minutes.**

APGAR score at 1 minute, N (%)				APGAR score at 5 minutes, N (%)			
	≤5.0	5.1-8.0	8.1-24.0		≤5.0	5.1-8.0	8.1-24.0
<7	2	6	10	<7	2	6	7
	50.00	85.70	12.70		50.00	85.70	8.90
>7	2	1	69	>7	2	1	72
	50.00	14.30	87.30		50.00	14.30	91.10
<b>Total</b>	4	7	79	<b>Total</b>	4	7	79
	100.00	100.00	100.00		100.00	100.00	100.00
Chi-square value=23.804, p value <0.001				Chi-square value=30.694, p value <0.001			

**Table 6: Rate of NICU and correlation of IUGR in different AFI groups.**

NICU admissions, N (%)				IUGR, N (%)			
	≤5.0	5.1-8.0	8.1-24.0		≤5.0	5.1-8.0	8.1-24.0
No	1	4	72	No	2	6	79
	25.00	57.10	91.20		50.00	85.70	100.00
Yes	3	3	7	Yes	2	1	0
	75.00	42.90	8.90		50.00	14.30	0.00
<b>Total</b>	4	7	79	<b>Total</b>	4	7	79
	100.00	100.00	100.00		100.00	100.00	100.00
Chi-square value=18.479, p value=0.001				Chi-square value=11.990, p value=0.002			

**Table 7: Comparison of mode of delivery in various studies.**

References	Mode of delivery	<5 cm	5.1-8 cm	8.1-24 cm
Suvarna et al. <sup>7</sup>	FTND (%)	29.1	62	87.3
	Instrumental delivery (%)	12.5	14	7.7
	LSCS (%)	58.3	24	4.9
Gupta et al. <sup>8</sup>	FTND (%)	17.95	62.79	86.44
	LSCS (%)	71.79	23.26	3.39
	Instrumental (%)	10.26	13.95	10.17
Present study	FTND/Instrumental (%)	25	28.57	60.75
	LSCS (%)	75	71.42	39.24

**Table 8: APGAR score at 1 and 5 minutes in different study.**

Study	APGAR at 1 minute (%)				APGAR at 5 minutes (%)		
	<5 cm	5.1-8 cms	8.1-24 cm	<5 cms	5.1-8 cms	8.1-24 cms	
Suvarna et al. <sup>7</sup>	<7	54.10	30	4.20	35.40	14	2.80
Gupta et al. <sup>8</sup>	<7	58.97	27.91	4.24	41.03	16.28	2.54
Present study	<7	50	85.70	12.70	50	85.70	8.90
	>7	50	14.30	87.30	50	14.30	91.10

Most common reason for emergency LSCS was fetal distress. In present study, fetal distress with oligohydramnios was 66.66%, this is comparable to study conducted by Suvarna et al and Gupta et al in which fetal distress was seen in 54% and 61.53% patients respectively.<sup>7,8</sup> In borderline AFI group, fetal distress was seen in 42.9% as compared to normal AFI group which was 7.1%. This represent that fetal distress are higher

with decreased amniotic fluid. Fetal distress in most common indication of LSCS in induced patient.

In present study, among oligohydramnios (AFI 0-5 cm), 25% babies passed thick meconium, while among group

of AFI 5-8 cm 28.6% babies passed thick meconium as compared to 3.8% babies in normal AFI group (Chi-



square value= 13.975, p value=0.007). The incidence of thick meconium-stained liquor was high in oligohydramnios group accounting for 25% of women and is comparable with the study conducted by Suvarna et al wherein thick meconium was found in 50% in AFI <5 cm group.<sup>7</sup> In present study, 50% (Post-hoc Bonferroni test p value=1.000) of patients had birth weight less than 2.5 kg, whereas in borderline group 42.8% (Post-hoc Bonferroni test p value=1.000) of had birth weight less than 2.5 kg, this is comparable to studies by Suvarna et al (36.9% in AFI <5 cms and 18.60% in AFI 5.1- 8 cms group), Gupta et al (37.5% in AFI <5 cms and 24% in AFI 5.1- 8 cms group).<sup>7,8</sup> APGAR score <7 at 1 min was seen in 50% (Chi-square value=23.804, p value <0.001) of cases among oligohydramnios in the present study, it was 54.1% in the study conducted by Suvarna et al and 58.97% in the study conducted by Gupta et al.<sup>7,8</sup> In present study out of total oligohydramnios (AFI 0-5 cm) 50% babies had APGAR <7 at 5 min, while 85.7% (Chi-square value =30.694, p value <0.001 babies with Borderline AFI had APGAR scores <7 compared to 8.9% babies with normal AFI. This shows that decreased AFI is associated with low APGAR. Results are comparable with studies done by Gupta et al and Suvarna et al found APGAR <7 in 35.4 % babies with oligohydramnios (0-5 cm).<sup>7,8</sup>

Incidence of NICU admission in present study is 50% in AFI 0-5 group while in Study conducted by Veena et al it is 36.58%, and Gupta et al it is 48.72%. Highest incidence of 92% was recorded by Bhagat et al.<sup>8-13</sup> No neonatal death occurred in this study. Incidence of IUGR in study conducted by Youseef et al was 79.9% and present study it was found to be 50%.<sup>14</sup> Hence, Oligohydramnios predicts occurrence of IUGR babies with a sensitivity of 50% in this study and this is comparable with earlier studies.

### Limitations

While conducting this study, it was expected the number of participants in group of AFI 0- 5 cm and AFI 5-8 cm to be more, However, after the final data compilation. There were less number of patients in these groups. This might be from the fact that in our hospital, antenatal patients with clinically reduced volume are usually evaluated at 34 weeks for amniotic fluid index, very severe oligohydramnios (AFI< 4 cm), are usually terminated before 37 weeks after fetal lung maturity. Hence, the number is very small. A larger and detailed prospective analysis study with larger N sample size is required to obtain better results.

### CONCLUSION

Significant association was found between decreased AFI and Caesarean section rate, fetal distress, Meconium-stained amniotic fluid, APGAR less than 7 at 5 minutes, low birth weight babies and neonatal morbidity. Induction of labor at term in antenatal women with

oligohydramnios and borderline liquor are associated with an increased risk of intrapartum fetal distress, Meconium-stained liquor and caesarean section in comparison to women with normal liquor. We recommend that amniotic fluid index determination should be an adjunct to other fetal surveillance methods. It helps to identify fetuses at risk of poor perinatal outcome and is a valuable screening test to predict fetal distress in labor that may need caesarean section. On the basis of our study, we have concluded that oligohydramnios and Borderline amniotic fluid was associated with high rate of pregnancy complications and adverse fetal outcomes and is an indicator of poor perinatal outcome. However, A larger and detailed prospective analysis study with larger N sample size is required to obtain better results.

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