



Correlation between Amniotic Fluid Index and Perinatal Outcome in Term Pregnancy

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Abstract

Objective: *The purpose of this study was to study and compare the perinatal outcome and mode of delivery in women with oligohydramnios, normal AFI and polyhydramnios group at term gestation having no complication.*

Methods: *This was a prospective study of 600 singleton pregnancies with gestational age between 37 to 42 weeks without any complicating factor. The AFI was determined in all cases using four quadrant technique. The cases were divided in 3 groups based on their AFI; $AFI \leq 5$ (Oligohydramnios), $AFI > 5-24$, $AFI \geq 25$ (Polyhydramnios). Maternal outcome in form of mode of delivery, abnormal fetal heart rate and cesarean section for fetal distress were studied and perinatal outcome in the form of meconium stained liquor, apgar score at 1 and 5 minute, birth weight, NICU admissions were studied.*

Results: *The groups had no statistical difference in age, parity, gestational age. There was no statistical difference in regards to MSL, NICU admissions, less apgar score at 1 and 5 minute, birth weight < 2.5 kg, non reassuring fetal heart rate, indications for cesarean sections. But the group with oligohydramnios had more number of cesarean sections which was statistically significant.*

Conclusion: *Oligohydramnios with AFI less than or equal to 5 is associated with statistically significant high cesarean delivery rate.*

Introduction

Being pregnant is one of the most rewarding phase in woman's life. Nurturing a human inside can most definitely be termed as an adventure. And every day in this adventure is exhilarating and blissful. Modern obstetrics is concerned with the health and wellbeing of both the mother and unborn child. Recognition of a fetus at risk for death or damage in utero, quantifying the risk, balancing fetal risk against neonatal complications from immaturity and determining the optional

time and mode of intervention are the cornerstones of modern perinatal medicine⁽¹⁾.

Amniotic fluid (AF) is an important part of pregnancy sac and helps in fetal development. It supports development of musculoskeletal system by permitting fetal movements in addition to growth and development of gastrointestinal system by swallowing amniotic fluid⁽²⁾. It surrounds the fetus and protects it from trauma, maintains body temperature and it has bacteriostatic properties. Its pressure helps in

reducing the loss of lung fluid and assist in pulmonary development⁽³⁾. It helps in dilatation of cervix and prevents cord compression⁽⁴⁾.

Amniotic fluid volume (AFV) varies with gestational age from 200ml at 16wks, 1000ml at 28wks, 900ml at 36wks and 800ml at 40wks of gestation⁽⁵⁾. There are various reported ultrasonographic modalities to assess AFV like (1) single deepest pocket (2) Two diameter pocket (3) AFI by 4 quadrant method described by Phelan et al in 1987⁽⁶⁾. Among them AFI is popular and reliable method of quantifying amniotic fluid till today.

Decrease in amniotic fluid is known as oligohydramnios which complicate about 1-5% of pregnancies at term⁽⁷⁾. Oligohydramnios is considered severe when the value of AFI is less than 5cm. AFI between 5 to 8 is termed as borderline oligohydramnios^(7,9). Oligohydramnios may develop in any trimester but found more commonly at 3rd trimester. About 12% woman may develop oligohydramnios after 42 wks due to receding placental function⁽¹⁰⁾. Decrease value of AFI has been associated with increased risk of intrauterine growth retardation, birth asphyxia, meconium aspiration syndrome, low APGAR score and risk of congenital anomalies^(11,12). Oligohydramnios is also associated with maternal morbidity in terms of increased rates of induction and operative interventions^(13,5).

The condition where abnormal increase in amniotic fluid volume or AFI >24cm is called polyhydramnios⁽¹³⁾. It complicates 1-2% pregnancies⁽¹⁴⁾. Approximately 50-60% of polyhydramnios cases are idiopathic. Part of polyhydramnios cases is attributed to fetal anomalies, fetal infection, fetomaternal hemorrhage, maternal diabetes⁽¹⁵⁾. The adverse perinatal outcome include preterm labor, premature rupture of membrane, cord prolapsed etc.

Thus either increase or decrease in AFI leads to adverse perinatal outcome. So keeping this in view by doing serial ultrasonographic estimation of AFV in the form of AFI from 2nd and 3rd

trimester of pregnancy provides a correct information about fetal conditions and play a significant role in obstetric management, timely delivery and subsequent fetal outcome.

In our study we included 600 cases and they were divided in three groups according to amniotic fluid index. We compared the perinatal outcome and mode of delivery between the groups.

Material and Methods

The study was undertaken in MKCG medical college and hospital, Berhampur. This was a perspective study from October 2016 to September 2018. The inclusion criteria were singleton term gestation with cephalic presentation, having AFI measurement within one week of delivery, without any medical and obvious obstetric complications. Exclusion criteria were known fetal and chromosomal anomalies, placental anomalies, multiple pregnancies, premature rupture of membrane, presence of other medical and obstetrics complications.

For all the selected cases detailed history was taken and clinical examination was performed and gestational age assessed. For all the women, ultrasound examination was done and amniotic fluid index was calculated by four quadrant technique after informed consent was obtained.

Women were divided into three groups based on their AFI: Group 1-AFI ≤5; Group 2- AFI >5-24; Group 3- AFI ≥25

Depending upon obstetric factors, investigations and clinical assessment decision for elective cesarean section and induction of labour was taken. Patients with spontaneous and induced labour were monitored.

Maternal outcome in the form of mode of delivery, labour related events like abnormal fetal heart rate and cesarean section for fetal distress were studied. Perinatal outcome in the form of APGAR score at 1 minute and 5 minute, birth weight, meconium staining of liquor and NICU admissions were studied. Results were tabulated and statistically analyzed. P value less than 0.05 was considered statistically significant.

Results and Observations

The following observations are made and plotted in tabulated form.

Table-1 Age in Relation To AFI

AGE	AFI			TOTAL
	≤5	>5-24	≥25	
<20 YEARS	36(18.18%)	54 (13.85%)	2 (16.67%)	92
20-29 YEARS	150(75.76%)	306 (78.46%)	9 (75%)	465
≥30 YEARS	12(6.06%)	30 (7.69%)	1 (8.33%)	43
TOTAL	198	390	12	600

P=0.68

Table-2 (Gravida distribution in relation to AFI)

GRAVIDA	AFI≤5		AFI>5-24		AFI≥25	
	No	%	No	%	no	%
G1	101	51.01	203	52.05	5	41.67
G2	69	34.85	116	29.74	3	25
G3 or above	28	14.14	66	18.21	4	33.33
Total	198	100	390	100	12	100

P=0.32

Table-3 Case Distribution according to AFI

AFI	No of cases	%
≤5	198	33
>5-24	390	65
≥25	12	2
Total	600	100

Table-4 Gestational Age with AFI

Gestational Age	AFI			Total
	≤5 (n=198)	>5-24 (n=390)	≥25 (n=12)	
≤40 weeks	138 (69.70%)	244 (62.56%)	12 (100%)	394
>40 weeks	60 (30.30%)	146 (37.44%)	0	206

p=0.08

Table-5 Mode of delivery with relation to AFI

Mode of delivery	AFI			TOTAL
	≤5	>5-24	≥25	
Cesarean	177 (89.39%)	144 (36.92%)	3 (25%)	324
Normal	21 (10.61%)	246 (63.08%)	9(75%)	276
Total	198	390	12	600

p =<0.00001

Table-6 Birth weight with relation to AFI

BIRTH WEIGHT	AFI			TOTAL
	≤5	>5-24	≥25	
<2.5 kg	75 (37.87%)	126 (32.31%)	3 (25%)	204
≥2.5 kg	123 (62.13%)	264 (67.69%)	9 (75%)	396
Total	198	390	12	600

p=0.32

Table-7 AFI with Meconium Stained Liquor

AFI	No of cases	Meconium stained liquor	Without meconium stained liquor
≤5	198	63 (31.81%)	135 (68.19%)
>5-24	390	114 (29.23%)	276 (70.77%)
≥25	12	0	12 (100%)

p=0.21

Table-8 Indication for Cesarean Section with Relation to AFI

Indication for cesarean	AFI			Total	p-value
	≤5	>5-24	≥25		
Non reactive FHR	114 (64.01%)	86 (59.72%)		200	0.55
CPD	54 (30.51%)	52 (36.11%)	3	109	
Failed induction	9 (5.08%)	6 (4.17%)		15	
Total	177	144	3	324	

p=0.55

Table-9 NICU Admission according to AFI

AFI	No of cases	NICU admission
≤5	198	36
>5-24	390	48
≥25	12	0
Total	600	69

p=0.098

Table-10 (Apgar Score @ 1MIN)

Apgar@1min	AFI			Total	P value
	≤5	>5-24	≥25		
<7	37 (18.69%)	51 (13.08%)	0	93	0.14
>7	156(81.31%)	339 (86.92%)	12 (100%)	507	
Total	198	390	4	600	

p=0.14

Table-11 (Apgar Score @ 5 MIN)

Apgar score@5min	AFI			Total	P value
	≤5	>5-24	≥25		
<7	28(14.14%)	42(10.77%)	0	70	0.44
>7	170(85.86%)	348(89.23%)	12(100%)	530	
Total	198	390	12	600	

p=0.44

Outcome Parameters in Study Population

Outcome parameters	Oligohydramnios group		Normal AFI group		Polyhydramnios group	
	No of patients	%	No of patients	%	No of patients	%
MSL	63	31.81	114	29.23	-	
LSCS	177	89.39	144	36.92	3	25
LSCS for fetal distress	114	57.58	86	22.05	-	
APGAR<7 @1MIN	37	18.69	51	13.08	-	
APGAR<7 @5MIN	28	14.14	42	10.77	-	
Birth wt <2.5kg	75	37.87	126	32.31	3	25
NICU admission	36	18.18	48	12.31	-	
Neonatal death	2	1.01	2	0.51	-	

In the above table, perinatal outcome of three AFI groups are shown. There were total 198 patients in oligohydramnios group, 390 patients in normal AFI group and 12 patients in polyhydramnios group.

Discussion

The present study was carried in the dept. of O & G to compare the perinatal outcome and mode of

delivery in uncomplicated term pregnancies with oligohydramnios, normal AFI and polyhydramnios group. Total 600 cases were studied, of which 198 cases had AFI≤5, 390 cases had AFI >5-24 and 12cases had AFI≥25.

Age wise distribution in the study showed that in the group with oligohydramnios mean age was 23.32, for the group with normal AFI was 23.56, for the group with polyhydramnios was 25.3.The

difference between the mean age between the groups was not statistically significant (p value=0.68). Menka verma et al conducted a similar study comparing pregnancy outcome in two groups of $AFI \leq 5$ and $AFI > 5$ and the results were comparable to our study with mean age being 25.98 and 26.1 respectively in two groups and no statistical difference between the mean age in two groups. (p value=0.76) ⁽¹⁵⁾.

In our study 51.01% women in the oligohydramnios group was nulliparous, 34.85% had parity P1, 14.14% had parity P2 or more; in the group with normal AFI 52.05% were nulliparous, 29.74% had parity P1, 18.21% had parity P2 or more. In polyhydramnios group five cases (41.67%) were nulliparous, three (25%) were primipara, four (33.33%) had parity \geq P2. There was no statistical difference in parity among groups ($p=0.32$). Overall 51.5% cases were nulliparous, 31.33% cases had parity of P1, 17.17% cases had parity of P3 or more. Bhagat et al found 68% women in nulliparous group in oligohydramnios group and 58.9% women nulliparous in normal AFI group in a study similar to us ⁽¹⁶⁾. Pradip R Gaikwad conducted a study and found that 63.2% women were nulliparous and 36.7% women were multiparous in group of oligohydramnios. In group of normal AFI 62.7% cases were nulliparous and 37.2% cases were multiparous ⁽¹⁷⁾. In a study by Richa kansal et al, they found that 64% patients were nulliparous in the oligohydramnios group ⁽⁴⁾.

In our study, distribution of gestational age was studied and 69.7% women in the group of oligohydramnios had gestational age less than or equal to 40 weeks. 30.3% women had gestational age more than 40 wks. In group of normal AFI 62.56% women below 40 weeks and 37.44% women belonged to >40 wks. All polyhydramnios cases were ≤ 40 weeks. No statistical difference between the groups as $p=0.08$. In another study results were found similar to our study with 76.4% cases with gestational age less than 40 weeks and 23.5% with more than 40 weeks in group with oligohydramnios. And 79.4% cases had

gestational age less than 40 and 18.1% had gestational age more than 40wks in gr 2 with no statistical difference between the groups ⁽¹⁸⁾.

In our study, it was found that 89.4% women underwent cesarean section and 10.6% women underwent normal delivery in the oligohydramnios group. In group with normal AFI 37% underwent cesarean and 63% underwent normal delivery. In polyhydramnios group 25% patients underwent cesarean delivery. This difference in mode of delivery is found to be statistically significant (p value=0.00001). Pradip R Gaikwad et al reported cesarean section was performed in 73.4% in oligohydramnios group and 37.2% in borderline AFI group ⁽¹⁷⁾. Bhagat et al did a similar study where they found 56% women in oligohydramnios group underwent cesarean section and 35% women underwent cesarean section in normal AFI group ⁽¹⁶⁾. Study by Mangal Puri et al reported 76% cesarean section in oligohydramnios group and 36% cesarean section in group with borderline AFI ⁽⁵⁾. Garima Gupta et al reported 71% cesarean rate in oligohydramnios group, 23% cesarean rate in borderline AFI group, 10% cesarean rate in Group having AFI 8-24 ⁽¹⁹⁾. Chate et al reported that overall cesarean rate was significantly higher in the group with $AFI \leq 5$ as compared to $AFI > 5$ cm ⁽²⁰⁾.

In our study, indication for cesarean section was not reassuring fetal heart rate in 64.01% and 59.72% of women in oligohydramnios and normal AFI group respectively. Bhagat et al reported 57% of all cesarean section in oligohydramnios group 35% of all cesarean section in normal AFI group due to non reassuring fetal heart rate ⁽¹⁶⁾. In another study the common indication for cesarean was similar which reported non reassuring fetal heart rate was responsible for 66% of all cesarean section in oligohydramnios group and 65% of all cesarean section in borderline AFI group ⁽⁵⁾.

We studied the perinatal outcomes and compared the NICU admission between the groups and in our study 18% of neonates had NICU admission in oligohydramnios group compared to 12.31%

NICU admission in normal AFI group and there was no NICU admission in polyhydramnios group. The difference was not found to be statistically significant in between the groups ($p=0.098$). In a similar study NICU admission was 32% in oligohydramnios group and 21% in borderline AFI group⁽⁵⁾. In another study NICU admission in oligohydramnios group was 7.8% and 3% in borderline AFI group⁽¹⁸⁾. Menka Verma et al reported 20% NICU admission in oligohydramnios group and 6% NICU admission in normal AFI group⁽¹⁵⁾. Chate et al also reported that the incidence of admission to NICU was significantly higher in AFI \leq 5cm group⁽²⁰⁾.

There were 4 neonatal deaths in our study, out of which 2 were born to oligohydramnios mother and 2 were born to mother having normal AFI. In oligohydramnios group out of 2 death one due to meconium aspiration syndrome and other due to respiratory distress leading to hypoxic ischemic encephalopathy. In normal AFI group 2 deaths were due to hypoxic ischemic encephalopathy.

We compared apgar score at 1 minute (<7) and at 5 minute (<7) and found that there were 18.69% neonates in oligohydramnios group and 13.08% neonates in normal AFI group with apgar score less than 7 at 1 minute ($p=0.14$). 14.14% neonates of oligohydramnios group and 10.77% neonates in normal AFI group had apgar score less than 7 at 5 minute

($p=0.37$) and the difference was not found statistically significant. Similarly to our study Menka verma et al found significant difference in apgar score at 1 minute in both the groups (26% vs 10%)⁽¹⁵⁾. Bhagat et al also found difference in apgar score at 1 minute between two groups (36% vs 11%)⁽¹⁶⁾. In our study, there was no significant difference in 5 min apgar score between the oligohydramnios and normal AFI group. Similarly to our study Bhagat et al found no difference in low apgar score at 5 minutes in the two groups⁽¹⁶⁾. In our study, in polyhydramnios group all the 12 neonates delivered had apgar score >7 at 1 minute and 5 minute.

In our study, meconium staining of liquor was compared between the groups. 31.8% women in oligohydramnios group and 29.2% women in normal AFI group had MSL. In polyhydramnios group all women had clear liquor. Here the difference was not statistically significant. ($p=0.21$). Mangal Puri et al did a similar study and MSL was found in 28% women in oligohydramnios group and in 16.36% in borderline AFI group⁽⁵⁾. In study by Menka Verma et al 12% women had MSL in oligohydramnios group and 14% women had MSL in normal AFI group and in both studies the difference was not significant⁽¹⁵⁾.

In our study, perinatal outcome in the form of birth weight of the neonates was compared and it was found that 38% ,32.3%,25% neonates had birth weight <2.5 kg, in oligohydramnios, normal AFI and polyhydramnios group respectively. The difference in birth weight between the groups was not significant in our study ($p=0.32$). Sultana et al observed that the difference in low birth weight was not significant between two groups of AFI ($p=0.4$)⁽¹¹⁾. In a study by Menka verma et al 36% neonates in oligohydramnios group and 14% neonates in normal AFI group had birth weight <2.5 kg and difference was statistically significant⁽¹⁵⁾. Bhagat et al reported 56% neonates had birth weight <2.5 kg in oligohydramnios group and 21% neonates had birth weight <2.5 kg in normal AFI group and the difference was statistically significant⁽¹⁶⁾.

Conclusions

It is concluded from the present study that the amniotic fluid index of less than or equal to 5 can be used as an yardstick for intervention in term pregnancy. Abnormal AFI is associated with adverse perinatal outcome in form of higher rate of meconium stained liquor, non reassuring fetal heart rate, low birth weight, poor apgar score at 1 and 5 minute, NICU admissions and neonatal mortality. Therefore patients with low AFI needed cesarean sections for better perinatal outcome.

To conclude with determination of AFI is auxiliary to other fetal surveillance methods and oligohydramnios with AFI less than or equal to 5 is associated with statistically significant high cesarean rate.

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