

## **Correlation between Amniotic Fluid Index and Perinatal Outcome in Uncomplicated Term Pregnancy**

**By**

**Dr Rajesh Mohanty**

Senior Resident, Dept. of Obst & Gynaecology, PRM Medical College, Baripada, Odisha

**Dr Subhalaxmi Dash**

Asst. Professor, Dept of Obst. & Gynaecology, MKCG Medical College, Berhampur, Odisha

**Dr Sudhanshu Sekhara Nanda**

Asso. Professor, Dept of Obst. & Gynaecology, Govt. Medical College, Kalahandi, Odisha

**Dr Chintamani Mohanta**

Asso. Professor, Dept of Obst & Gynaecology, PRM Medical College, Baripada, Odisha

**Dr Sudhanshu Sekhara Nanda**

Asso. Professor, Dept of Obst. & Gynaecology, Govt. Medical College, Kalahandi, Odisha

Email: [sudhansu81@gmail.com](mailto:sudhansu81@gmail.com)

### **Abstract**

**AIM:** To find out the sensitivity of correlation of Amniotic fluid index to perinatal outcome and the obstetrical management and its effect on maternal health in uncomplicated term pregnancy. **SETTING:** The study was conducted as a prospective observational study on 300 ultrasound proven cases at PRM MEDICAL COLLEGE, Baripada, Odisha, India. **METHOD OF STUDY:** In our study we studied 600 cases who fulfilled our inclusion and exclusion criteria, the eligible cases were recruited from opd, ipd and labour room from our institute. 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. Approval from the Institutional ethics committee. Amniotic fluid index estimation was done by B-Mode real time electronic array linear scanner using four quadrant technique described by phelan et al. Women were divided into three groups based on their AFI: Normal AFI >5– 24 cm, Oligohydramnios ≤5cm Polyhydramnios ≥25 cm 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. Indications for NICU admission included meconium aspiration syndrome, neonatal depression, cyanosis, transient tachypnoea of newborn and jaundice. Results were tabulated and statistically analyzed. P value less than 0.05 was considered statistically significant. **RESULTS:** Total 600 cases were studied, of which 198 cases had AFI≤5, 390 cases had AFI >5-24 and 12 cases had AFI≥25. 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 ≥ 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. 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 >40wks.All polyhydramnios cases were  $\leq 40$ weeks In our study,it was found that89.4% 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. In our study,indication for cesarean section was non reassuring fetal heart rate (64.01%)and CPD(30.51%) in oligohydramnios group.In normal AFI group non reassuring fetal heart rate was the cause for 59.72% cesarean section where as CPD was the cause for 36.11% of cesarean section.Failed induction was the cause for LSCS in 5% cases in oligohydramnios gr and 4% cases in normal AFI gr. 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**CONCLUSION:** The determination of AFI can be used as an adjunct to other fetal surveillance methods and oligohydramnios with AFI less than or equal to 5 is associated with statistically significant high cesarean rate.

## Introduction

Amniotic fluid is the fluid within amniotic cavity in which fetus lives<sup>1</sup>.The amniotic fluid surrounds the fetus everywhere except its attachment with body stalk. Amniotic fluid is produced by transudation from maternal serum, placental membranes, secreted from amniotic epithelium<sup>2</sup>.There is transudation of fetal plasma through fetal skin before 20weeks.From 2<sup>nd</sup> trimester fetus swallows, urinate and inspire amniotic fluid<sup>3</sup>.

### *Production*

- Transudation of maternal serum
- Secretion from amniotic epithelium
- Transudation of fetal plasma through the highly permeable fetal skin before it keratinized at 20 wks.
- Fetal urine output (at term it is about 400-1200ml daily)
- Fetal lung fluid that enters the amniotic cavity to add its volume<sup>4</sup>.

### *Excretion*

- Fetus swallows about 400-700 ml of liquor everyday.
- Intramembranous absorption of water and solutes (200-500ml/day) through the amniotic epithelium
- Through the fetal surface of the placenta<sup>5</sup>.

### *Volume*

Amniotic fluid, volume is related to gestational age.It measures about 50ml at 12 weeks, 400ml at 20 weeks and reaches its peak of 1 liter at 36-38 weeks. Thereafter the amount diminishes, till at term it measures about 600-800 ml.As the pregnancy continues post term, further reduction occurs to the extent of about 200ml at 43 weeks<sup>6</sup>.

### *Function*

Its main function is to protect fetus during the course of pregnancy and labour. Function of amniotic fluid during pregnancy:

- It acts as a shock absorber, protecting the fetus from possible extraneous injury.

- Maintains an even temperature.
- The fluid distends the amniotic sac and there by allows for growth and free movements of the fetus and prevents adhesion between the fetal part and amniotic sac.
- Its nutritive value is negligible, however water supply is quite adequate.

Function of amniotic fluid during labour:

- The amnion and chorion are combined to form a hydrostatic wedge which helps in dilatation of cervix.
- During uterine contraction, it prevents marked interference with the placental circulation as long as the membranes remain intact.
- It flushes the birth canal at the end of the 1<sup>st</sup> stage of labour and by its aseptic and bacteriocidal action protects the fetus and prevents ascending infectin to the urinary cavity.

## **Material and Methods**

The study on “correlation between amniotic fluid index and perinatal outcome in uncomplicated term pregnancy” was undertaken in the department of obstetrics and gynecology, PRM medical college and hospital, Baripada. The cases were studied at random during the period from October 2020 to September 2021.

Place of study:ANC OPD, labour room, ANC ward

Sample size: sample size of the study is 600

## **Aim of Study**

1. The sensitivity of AFI to perinatal outcome.
2. The obstretical management and its effect on maternal health

## **Objectives**

In the present study our objective is to study and compare the mode of delivery and perinatal outcomes in term pregnancies without any complications divided in three different groups based on AFI.

## **Study Design**

Prospective longitudinal study

### ***Inclusion Criteria:***

Pregnant women at term gestation with

1. Singleton pregnancy with cephalic presentation
2. Intact membranes
3. Sure about dates
4. Having AFI measurement within one week of delivery
5. Without any medical and obvious obstetric complications

***Exclusion Criteria:***

1. Pregnant women below 37 weeks of gestation and above 42 weeks of gestation
2. Known fetal and chromosomal anomalies
3. Placental anomalies
4. Multiple pregnancies
5. Premature rupture of membrane
6. Presence of other medical and obstetrics complications

Though extreme variations in AFI possesses risk for pregnancy, in this study we include this in our study criteria as we intend to get and compare the perinatal outcome and obstetric management of groups of patients based on AFI.

**Method of Study**

In our study we studied 600 cases who fulfilled our inclusion and exclusion criteria, the eligible cases were recruited from opd, ipd and labour room from our institute. 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. Approval from the Institutional ethics committee of PR Medical College was also taken.

Amniotic fluid index estimation was done by B-Mode real time electronic array linear scanner using four quadrant technique described by phelan et al. In supine position uterine cavity was divided by using umbilicus and linea nigra as reference points for the upper and lower halves and for left and right halves respectively. The ultrasound transducer was placed in a perpendicular plane to the patient table and in a sagittal plane to the woman herself, but was never angled to follow the curvature of maternal abdomen. The deepest, unobstructed and clear pocket of amniotic fluid was visualized and the image was frozen. The ultrasound calipers were manipulated to measure the pocket in strictly vertical direction. The process was repeated in each of the four quadrants and the pocket measurements were summed up to form AFI in centimeter.

Repeat examination by a single observer results in best accuracy. Other factors that affect AFI reproducibility are measuring narrow pockets, measuring into gray or fuzzy tangential section of placenta or fetal parts and measuring the same pocket twice in adjacent quadrants. The effect of fetal movement during the scanning process may change the AFI by 1.5-2.5 cm. Caution was exercised to avoid excessive pressure on the transducer as it can alter AFI measurements.

Women were divided into three groups based on their AFI:

Normal AFI  $>5-24$  cm

Oligohydramnios  $\leq 5$  cm

Polyhydramnios  $\geq 25$  cm

Other variables from ultrasound examination are Biparietal diameter (BPD), Femur length (FL), Abdominal circumference (AC), Head circumference (HC), Estimated fetal weight (EFW)

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. Indications for NICU admission included meconium aspiration syndrome, neonatal depression, cyanosis, transient tachypnoea of newborn and jaundice.

Results were tabulated and statistically analyzed. P value less than 0.05 was considered statistically significant.

**Table:1** Distribution According To Gravida Status

GRAVIDA	AFI $\leq$ 5		AFI>5-24		AFI $\geq$ 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

This table depicts 101 cases, 69 cases, 28 cases of oligohydramnios group belong to group G1, G2,  $\geq$ G3 respectively. Normal AFI found in 203 cases (G1), 116 cases (G2), 66 cases ( $\geq$ G3). In polyhydramnios group 5 cases, 3 cases, 4 cases belonged to G1, G2,  $\geq$ G3 respectively. Here  $p=0.32$ , hence there is no significant difference between the groups in parity.

**Table:2** Distribution According To Age:

AGE	AFI			TOTAL
	$\leq$ 5	>5-24	$\geq$ 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
$\geq$ 30 YEARS	12(6.06%)	30 (7.69%)	1 (8.33%)	43
TOTAL	198	390	12	600

This table shows in oligohydramnios group, 18.18% women were below 20 years, 75.76% women were between 20-29 years and 6.06% women were in  $\geq$ 30 years group. In normal AFI group, 13.85%, 78.46%, 7.69% women belonged to <20, 20-29 and  $\geq$ 30 years groups respectively. In polyhydramnios group, 16.67% patients had <20 yr, 75% patients belonged to 20-29 years age group and 8.33% patients belonged to  $\geq$ 30 yr groups.

**Table:3** Distribution According To Age:

AFI	No of cases	%
$\leq$ 5	198	33
>5-24	390	65
$\geq$ 25	12	2
Total	600	100

This table shows 198 cases (33%) were oligohydramnios, 12 cases (2%) polyhydramnios and 390 cases (65%) grouped under normal AFI group.

**Table:4** Mode Of Delivery:

Mode of delivery	AFI			TOTAL
	$\leq$ 5	>5-24	$\geq$ 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

This table shows that cesarean section was performed in 89.39% cases having AFI $\leq$ 5 compared to 36.92% cases with normal AFI. 10.61% cases undergone vaginal delivery with AFI $\leq$ 5 and 63.08% had vaginal delivery with normal AFI.75% cases of polyhydramnios undergone vaginal delivery. Here the p value= $<0.00001$  and it shows there is significant difference between mode of delivery among the groups. Overall in 54% patients cesarean section was the mode of delivery.

**Table:5** *Afi And Birthweight:*

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

This table shows 37.9% cases of Gr 1 ,32.3% cases of Gr 2, 25% cases of Gr 3 had babies of birth weight  $<2.5$  kg; and 62.1% cases of Gr 1,67.7% cases of Gr 2, 75% cases of Gr 3 had babies of birth weight  $\geq 2.5$ kg.Here p=0.32,hence no significant difference in birth weight between the groups.

**Table:6** *Indications Of Caesarean Section:*

Indication for cesarean	AFI			Total	p-value
	$\leq 5$	$>5-24$	$\geq 25$		
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	

Out of the women who underwent cesarean section 64.01 % patients presented with non-reactive FHR ,30.5% cases presented with CPD,5.1% cases with induction failure in Gr 1.In Gr 2, 59.72% cases had non reassuring FHR,36.11% cases had CPD,4.17% cases had induction failure.In Gr 3 ,three patients which undergone LSCS presented with CPD.As p=0.55,there is no significant difference in indication for cesarean section between the groups.

**Table:7** *Nicu Admission:*

AFI	No of cases	NICU admission
$\leq 5$	198	36
$>5-24$	390	48
$\geq 25$	12	0
Total	600	69

This table shows 36 cases (18.2%) of Gr 1 had babies admitted to NICU and 48 cases (12.31%) of Gr 2 had babies admitted to NICU.In Gr 3 no babies admitted to NICU. As the p=0.098,the data shows there is no significant difference in NICU admission between the groups.



**Table:8 Outcomes According To Afi:**

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.

## Conclusion

It is concluded from the present study that the amniotic fluid index of less than or equal to 5 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. Patients with low AFI needed cesarean sections to prevent perinatal mortality and morbidity along with close antepartum and intrapartum monitoring.

Therefore the determination of AFI can be used as an adjunct 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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