


Original Research Article

Role of amniotic fluid index in pregnancy outcome

Aesha Patel*, H.V. Patel

Department of Obstetrics and Gynecology, B.J. Medical College, Ahmedabad, Gujarat, India

*Corresponding author email: aeshapatel_1812@yahoo.com

	International Archives of Integrated Medicine, Vol. 2, Issue 8, August, 2015. Copy right © 2015, IAIM, All Rights Reserved. Available online at http://iaimjournal.com/	
	ISSN: 2394-0026 (P)	ISSN: 2394-0034 (O)
	Received on: 08-07-2015	Accepted on: 17-07-2015
	Source of support: Nil	Conflict of interest: None declared.

Abstract

Background: Amniotic fluid is vital to the well-being of the fetus. Disorders of liquor amnii has a significant impact on pregnancy and fetus, it prompted us to carry out this study with sincere efforts to find out its effect on pregnancy outcome.

Aim and objectives: To find out incidence of polyhydramnios and oligohydramnios in our setup and to study possible etiological factors for abnormal AFI.

Material and methods: We performed a study on 200 patients over a period of one year. Detailed history, general examination and local examination were done. All the cases were subjected to ultrasonography to see for maturity, AFI, congenital anomalies. Analysis were made regarding mode of delivery and perinatal outcome which includes maturity, birth weight, incidence of SGA or macrosomia, NICU admission, maconium stained amniotic fluid, low apgar score, incidence of birth asphyxia and congenital anomalies.

Results: There were total 82 cases of oligohydramnios and 18 cases of polyhydramnios. And 100 cases with normal AFI. In ultrasonography 154 cases had full term maturity and 46 cases were preterm 82 cases had $AFI \leq 5$ cm, 18 cases had $AFI \geq 24$, and 100 cases had AFI between 6-23.

Conclusion: Amniotic fluid index assessment has become an important part of ante-partum fetal surveillance and also it has a prognostic value for fetal and newborn outcome.

Key words

Pregnancy, Amniotic fluid index, Polyhydramnios, Oligohydramnios.

Introduction

Amniotic fluid is vital to the well-being of the fetus. It cushions the fetus from injury, helps to prevent compression of the umbilical cord, and allows room for it to move and grow. In addition,

its bacteriostatic action helps to prevent infection of the intra-amniotic environment. The quantity of amniotic fluid at any time in gestation is the product of water exchange between the mother, fetus, and placenta, and is maintained within a relatively narrow range. Disorders of this

regulatory process can lead to either polyhydramnios or oligohydramnios, in which too much or too little fluid exists, respectively. These disorders may result from abnormal fetal or maternal conditions and, conversely, may be responsible for alterations of fetal well-being as well. With the advent of real-time ultrasonography, assessment of amniotic fluid has been possible, resulting in earlier recognition of abnormal conditions and possible intervention. Since, these disorders of liquor amnii has a significant impact on pregnancy and fetus, it prompted us to carry out this study with sincere efforts to find out its effect on pregnancy outcome [1, 2].

Aim and objectives

- To find out incidence of polyhydramnios and oligohydramnios in our setup.
- To study possible etiological factors for abnormal AFI.
- To determine the effect of it on growth of fetus and mode of delivery.
- To study perinatal outcome in the form of live birth, intrauterine death, still birth, and neonatal mortality, NICU admission.
- To discuss preventive measures and future preventing options.

Material and methods

We performed a study on 200 patients over a period of one year. Detailed history was taken. Cases were enquired for any complaints of decrease fetal movement, leaking per vaginum, abdominal pain, pressure symptoms or symptoms of pre-eclampsia. Particular enquiry was done about the last menstrual period (to rule out wrong dates). History of polyhydramnios or oligohydramnios in past pregnancy, any malpresentation or congenital anomalies to the previous baby was also inquired. History was asked regarding any medical disorders like diabetes mellitus, thyroid, and hypertension. General examination of each patient was done with attention to vitals, weight, CVS and RS. Local examination was done with specific

measurement of fundal height, clinical assessment of liquor, auscultation of FHS, and observes for any bradycardia, tachycardia, variability or decelerations in FHS. All the cases were subjected to ultrasonography to see for maturity, AFI, congenital anomalies. Fetal evaluation included daily fetal movement count, non stress test, ultrasound, and antenatal Doppler (selected cases) with continuous monitoring of FHS. Analysis were made regarding mode of delivery and perinatal outcome which includes maturity, birth weight, incidence of SGA or macrosomia, NICU admission, maconium stained amniotic fluid, low apgar score, incidence of birth asphyxia and congenital anomalies. Depending upon the severity of condition decision regarding induction of labour or elective / emergency LSCS were taken.

Results and Discussion

200 patients over a period of one year were studied. There were total 82 cases of oligohydramnios and 18 cases of polyhydramnios and 100 cases with normal AFI as per **Table – 1** and **Graph - 1**. Total 7948 deliveries were conducted during 1 year , of which 451 cases of abnormal AFI in our institute, so the Incidence of oligohydramnios were 4.1% and polyhydramnios were 1.1%. Incidence of oligohydramnios according to various studies was 3.9% and 3.1% [3, 4]. Incidence of polyhydramnios according to one study was 2% [5], which was comparable to our study.

As per **Table – 2**, majority of the patients that was 63% of oligohydramnios and 61% of polyhydramnios were emergency admissions and many were referred. In the one study, the percentage of emergency admissions was 55% and 45% respectively [5].

As per **Table – 3** and **Graph - 2**, 54% of women with oligohydramnios were in the age group of 21 to 25 years and 27% of cases were between 26 to 30 years. Thus 81% of cases of oligohydramnios in the present study were between 21 to 30 years of age. In one study 142

cases of oligohydramnios were studied and the mean maternal age found was 23.9 ± 5.9 years [6]. One study showed that mean maternal age was 22.8 ± 4.2 years [7]. Also 56% of women with polyhydramnios were in the age group of 26 to 30 years. One study reported that 52% of cases were between the age group of 25 to 30 years which was comparable to our study [8].

Table – 1: Incidence of oligohydramnios and polyhydramnios.

Group	Total cases	Oligohydramnios	Polyhydramnios	Normal AFI
No. of cases in study	200	82	18	100

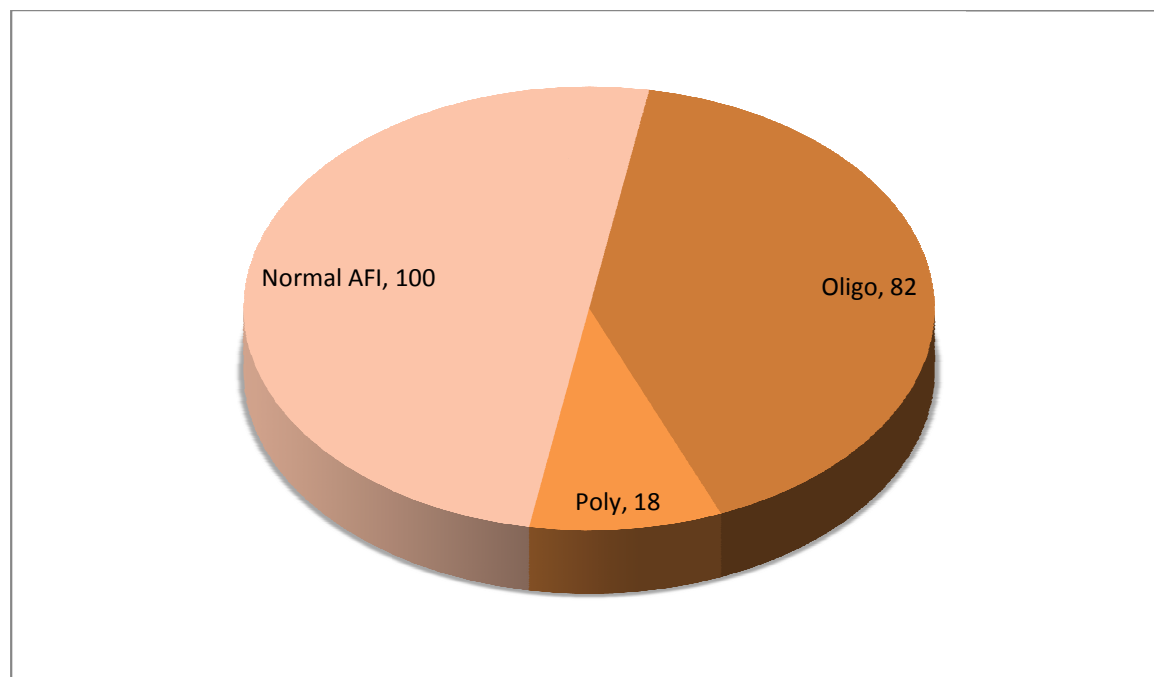
Table – 2: Admission status of cases.

Group	Emergency	Booked	Total
Oligohydramnios	52	30	82
Polyhydramnios	11	7	18
Normal AFI	55	45	100

Table – 3: Maternal characteristics of study population.

Group	<20 year	21-25 year	26-30 year	≥31 year
Oligohydroamnios	10	45	22	5
Polyhydroamnios	4	2	10	2
Normal AFI	25	45	20	5

Graph – 1: Incidence of oligohydramnios and polyhydramnios.

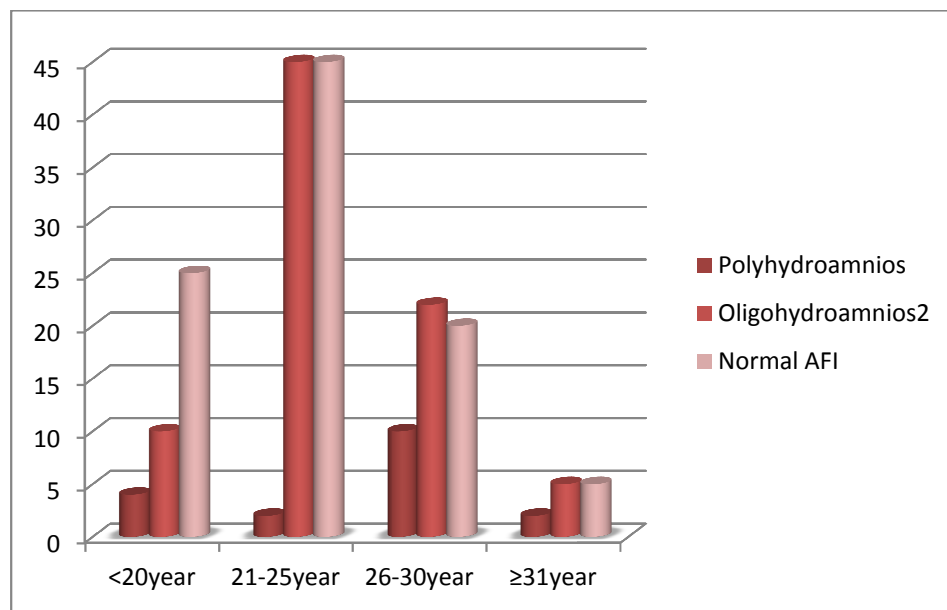


Present study showed that 53% cases were primi para and 22% were 2nd para of oligohy, thus incidence of oligohydroamnios is more common in primi gravida patients as per **Table – 4** and **Graph - 3**. Study conducted by Donald D. Meintire, et al. in April 2000 on oligohydramnios

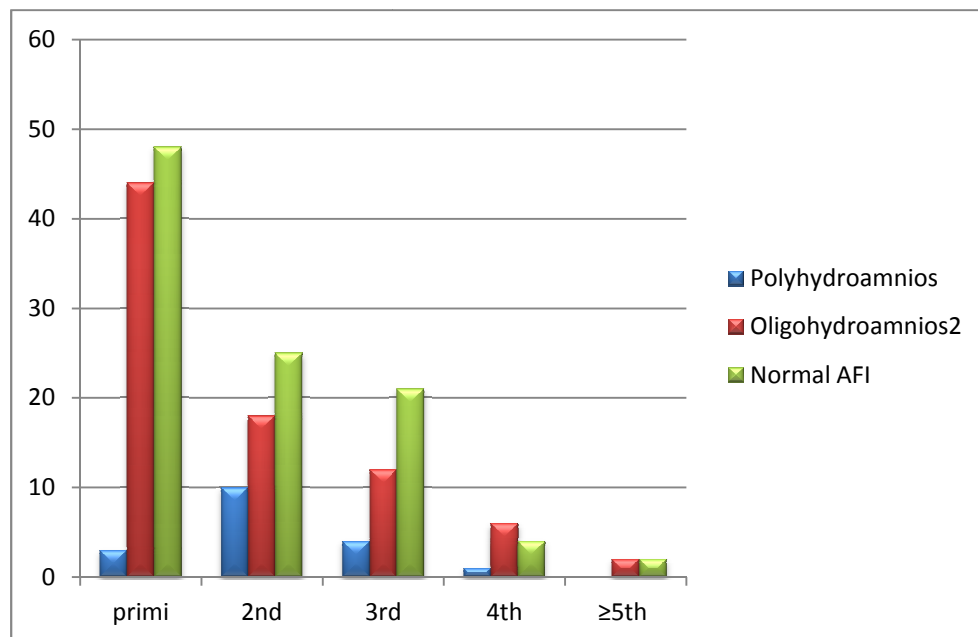
showed 40% cases in his study were primi para patients. In the present study polyhydramnios was found more in multi gravida i.e. 55% of cases in 2nd para and 22% were 3rd para, so 77% of cases in the present study were multi gravida suggesting that incidence of polyhydroamnios

was more in multi gravida cases. One study mentioned there was significant rise in polyhydroamnios with advanced maternal age, in their study 12.2% of subjects were over 40 years old and were that of multi gravid [9].

Graph – 2: Maternal characteristics of study population.



Graph – 3: Distribution of cases in relation to parity.



In present study there were 45 cases (49.4%) of oligohydramnios occurs in the 37 to 40 weeks as

per **Table – 5** and **Graph - 4**. One author mentioned that oligohydramnios developing

early in pregnancy is less common and frequently has a poor prognosis. By contrast, in pregnancies that continue beyond term, diminished fluid volume may be found often. There were 12 case (66.67%) of polyhydramnios occurred in the 37 to 40 weeks. One study mentioned mean gestation age for polyhydramnios was 38.6 ± 1.2 weeks [10]. Another study pointed that mean gestation age for polyhydramnios was 40.3 ± 1.6 weeks [11]. In the present study, 15 (18%) cases presented with decrease fetal movement, 13 (15%) cases presented with leaking per vaginum, 11(13%)

cases presented with abdominal pain 30 (36%) cases diagnosed clinically or by use of oligohydramnios and in case of polyhydramnios, 2 (11%) cases presented with leaking per vaginum, 8 (44%) cases presented with abdominal pain, 2 (11%) cases presented with pressure symptoms, 5 (28%) cases diagnosed by ultrasound as per **Table - 6**. So, majority of patients with oligohydramnios at the time of presentation were symptomless which were diagnosed clinically or by ultrasonography, and majority of patients of polyhydramnios were presented with abdominal pain.

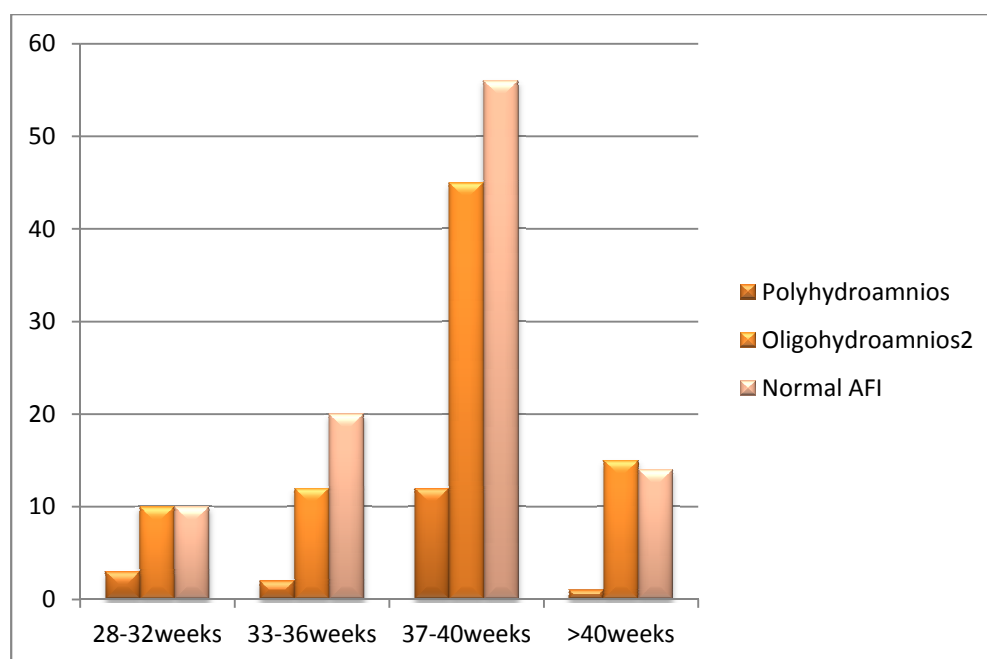
Table – 4: Distribution of cases in relation to parity.

Group	Primi	2 nd	3 rd	4 th	≥5 th
Oligohydramnios	44	18	12	6	2
Polyhydramnios	3	10	4	1	0
Normal AFI	48	25	21	4	2

Table – 5: Distribution of cases in relation to weeks of gestation.

Group	28-32 weeks	33-36 weeks	37-40 weeks	>40 weeks
Oligohydramnios	10	12	45	15
Polyhydramnios	3	2	12	1
Normal AFI	10	20	56	14

Graph – 4: Distribution of cases in relation to weeks of gestation



In the present study majority of cases, the cause of oligohydramnios is idiopathic accounting for 48% of total cases, preeclampsia in 17% of cases, followed by post datism in 14% of cases; congenital anomalies were found in 4% of cases. Anemia, thyroid disorder, diabetic mellitus contributes to 2%, 1% and 1% cases respectively as per **Table - 7**. For polyhydramnios 55.5% of

cases were idiopathic type 17% of cases were due to congenital anomalies of fetus, 11% of cases were due to diabetes. Pre eclampsia Rh incompatibility and post date accounting for 5% of cases each. One study concluded that most common etiological factor was idiopathic in 68 cases, followed by congenital in 13 followed by GDM in 7 cases [12].

Table – 6: Distribution of cases in relation to clinical presentation.

Group	Oligohydramnios	Polyhydramnios	Normal AFI
Decrease fetal movement	15	-	3
Leaking per vaginum	13	2	12
Abdominal pain	11	8	78
Pressure symptoms	-	2	-
No complains (Diagnose clinically/USG)	30	5	-
Headache/ edema feet	13	1	7

Table – 7: Distribution of cases according to associated maternal conditions.

Group	Oligohydramnios	Polyhydramnios	Normal AFI
Pre eclampsia	14	1	6
Anemia	2	-	11
Multiple pregnancy	-	-	2
Diabetes	1	2	1
Rh incompatibility	-	1	-
Post date	12	1	11
PROM	7	-	12
Congenital and chromosomal anomalies	4	3	-
Cardiac disease	1	-	-
Idiopathic	40	10	47
Thyroid disorders	1	-	1

One study conducted on 147 patients with oligohydramnios, in 89 (60.5%) cases, cause was idiopathic, PIH accounted for 18 (12%) cases , post datism was found in 18 (8%) cases, uteroplacental insufficiency due to other causes in 28 (19%) cases and congenital malformation was found in 15 (10%) cases. In one study on 490 patients with oligohydramnios, idiopathic was a cause in 140 (28.57%) cases, PIH in 97 (19.7%), post datism in 89 (18.16%) cases. Chronic hypertension was a cause in 16 (3.26%)

cases whereas uteroplacental insufficiency due to other causes accounted for 15 (3.06%) [9, 10, 11]. Thus the most common etiological factor for oligohydramnios is idiopathic which is followed by PIH and post datism, and most common cause for polyhydramnios is also idiopathic followed by congenital anomalies followed by diabetes. As per **Table – 8**, in oligohydramnios there were total 68 (83%) cases of vertex presentation, 12 (14.6%) cases of breech presentation, 2 (2%) cases of transverse lie. So there were 18%

chances of abnormal presentation in case of oligohydramnios as compared to 10% chances with normal AFI. In case of polyhydramnios there were total 11 (61%) cases of vertex presentation, and 7 (39%) cases with abnormal presentation, so there were 39% chances of abnormal presentation compared to 10% in case with normal AFI.

In our study, non stress test (NST) was performed in all 200 cases as a part of ante-partum surveillance. Of these, 44% cases had non-reactive NST, 20% had equivocal and 36% cases had a reactive NST in case of oligohydramnios. And in case of polyhydramnios 83% had reactive NST 11% had equivocal NST, 5% had non reactive NST as per **Table – 9** and **Graph - 5**.

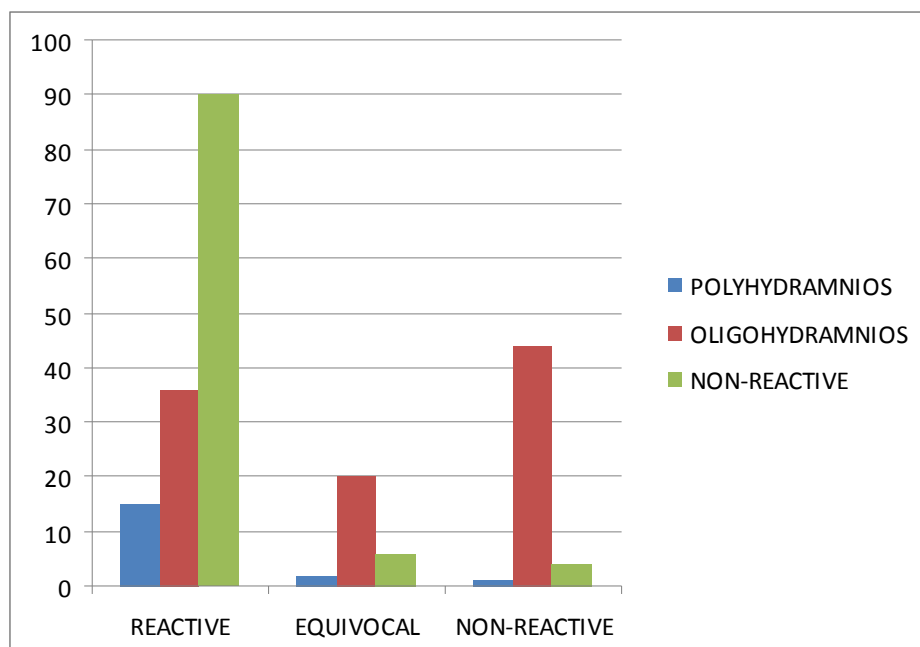
Table – 8: Distribution of cases in relation to presentation of fetus.

Group	Vertex	Breech	Other	Total
Oligohydramnios	68	12	2	82
Polyhydramnios	11	5	2	18
Normal AFI	90	8	2	100

Table – 9: NST in association with AFI in study population.

Group	Reactive	Equivocal	Non-reactive
Oligohydramnios	36	20	44
Polyhydramnios	15	2	1
Normal AFI	90	6	4

Graph – 5: NST in association with AFI in study population.



Relationship of oligohydramnios is more consistent with fetal well being. In present study, 20 cases of oligohydramnios had an equivocal

NST in which no acceleration or deceleration was present. 44 cases had a non reactive NST in the form of either variable or late deceleration or

prolonged bradycardia. All such cases were indication for termination of pregnancy. Of the 6 cases with prolonged bradycardia, 5 babies expired and 1 baby was kept in NICU for 3 days had thick MSL but survived. Of the 8 cases with late decelerations, 2 babies expired, one had severe birth asphyxia with hyaline membrane disease with severe IUGR and other had severe birth asphyxia with maconium aspiration syndrome. Ultrasonography was done in all cases (n=200), all patients had AFI as measured by 4

gradient technique. 154 cases had full term maturity and 46 cases were preterm, 82 cases had AFI ≤ 5 cm, 18 cases had AFI ≥ 24 , and 100 cases had AFI between 6-23. Congenital anomalies were found in 7 cases as per **Table - 10**. As per **Table - 11** and **Graph - 6**, out of 82 patients of oligohydramnios 52 (63.4%) cases had LSCS, 30 (36.5%) cases had vaginal delivery, and out of 18 patients of polyhydramnios 3 (17%) had LSCS and 15 (83.3%) had vaginal delivery.

Table – 10: Ultrasonographic findings in study population.

Maturity	Preterm	46
	Full term	154
AFI	≤ 5	82
	6-23	100
	≥ 24	18
Congenital anomalies	Renal agenesis	2
	Spina bifida	1
	Duodenal atresia	1
	Anencephaly	1
	Hydrocephalus	1
	ASD + VSD	1

Table – 11: Mode of delivery.

Mode of delivery	Oligohydramnios	Polyhydramnios	Normal AFI
LSCS	52	3	32
VAGINAL	30	15	68

In present study, out of 100 cases of abnormal AFI 83 babies were born live, 6 babies were still birth, and 11 babies were PNM as per **Table – 12** and **Graph - 7**. One study on oligohydramnios 136 (93.7%) babies were born alive and 2 (1.3%) babies were still birth. Of live babies, 7 (5.1%) expired within a few hours of birth, also one study on polyhydramnios showed that out of 70 cases 56 (73.68%) were LB baby, 20 (26.32%) were SB, there were 4 (5.26%) early neonatal deaths and main cause of it was prematurity [13, 14]. As per **Table – 13**, post partum complications associated with oligohydramnios were puperal pyrexia in 5 (6%) cases which were associated with PROM, DIC in 3 (3.6%) cases

Which were associated with PIH , anemia in 2(2.4%) cases , sub involution in 4(4.1%) case, 68 (83%) cases were uncomplicated, with polyhydramnios atonic PPH in 2(11.1%) cases, puperal pyrexi in 1 (5.5%) case, anemia in 2 (11.1%) cases , subinvolution in 2 (16.6%) cases, 11 (66%) case were uncomplicated. Cases with normal AFI atonic PPH in 2 cases DIC in 2 cases, anemia in 11 cases, subinvolution in 4 cases and 81 cases were uncomplicated. So, oligohydramnios is mostly associated with puperal pyrexia due to PROM, followed by DIC due To its association with PIH, and polyhydramnios is mostly associated with atonic PPH and subinvolution of uterus [15, 16, 17].

Graph – 6: Mode of delivery.

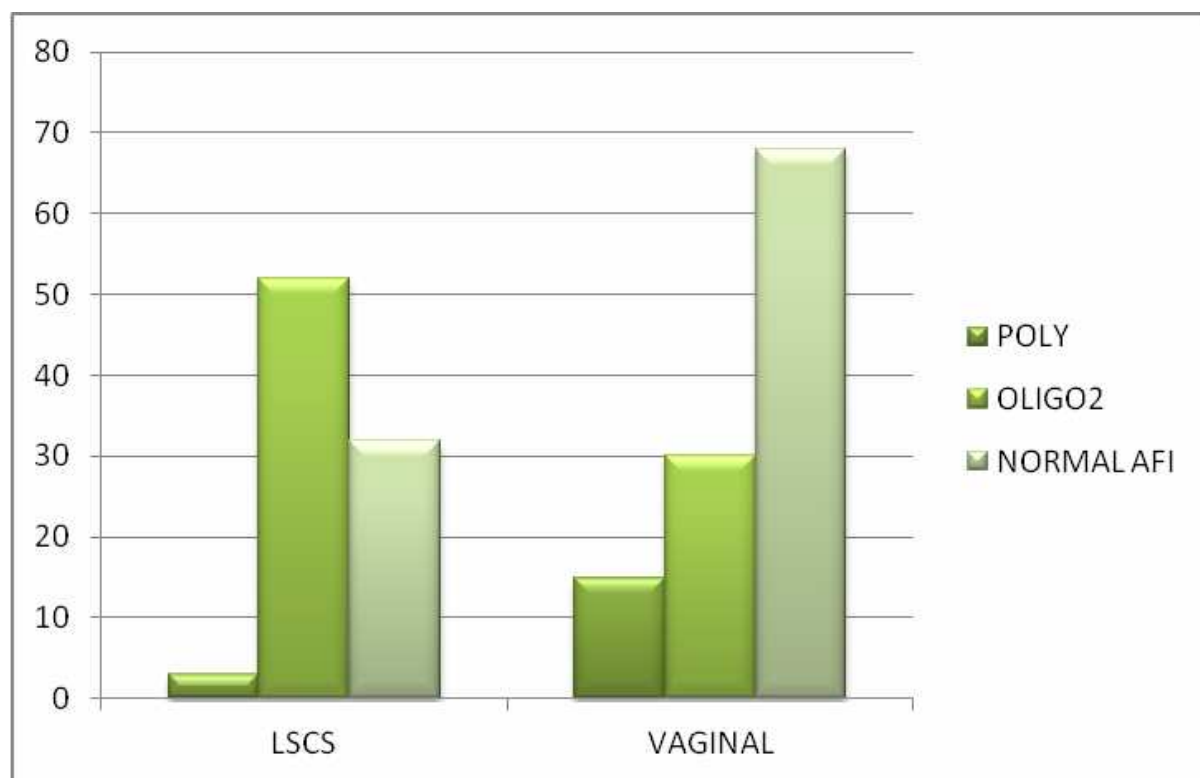


Table – 12: Perinatal outcome in study population.

Group	Live birth (LB)	Still birth (SB)	Prematurity (PNM)
Oligohydramnios	68	5	9
Polyhydramnios	15	1	2
Normal AFI	95	2	3

Table – 13: Post partum maternal complications in study group.

Complications	Oligohydramnios	Polyhydramnios	Normal AFI
Atonic PPH	-	2	2
Puperal pyrexia	5	1	-
DIC	3	-	2
Anemia	2	2	11
Sub involution	4	2	4
Uncomplicated	68	11	81
Total	82	18	100

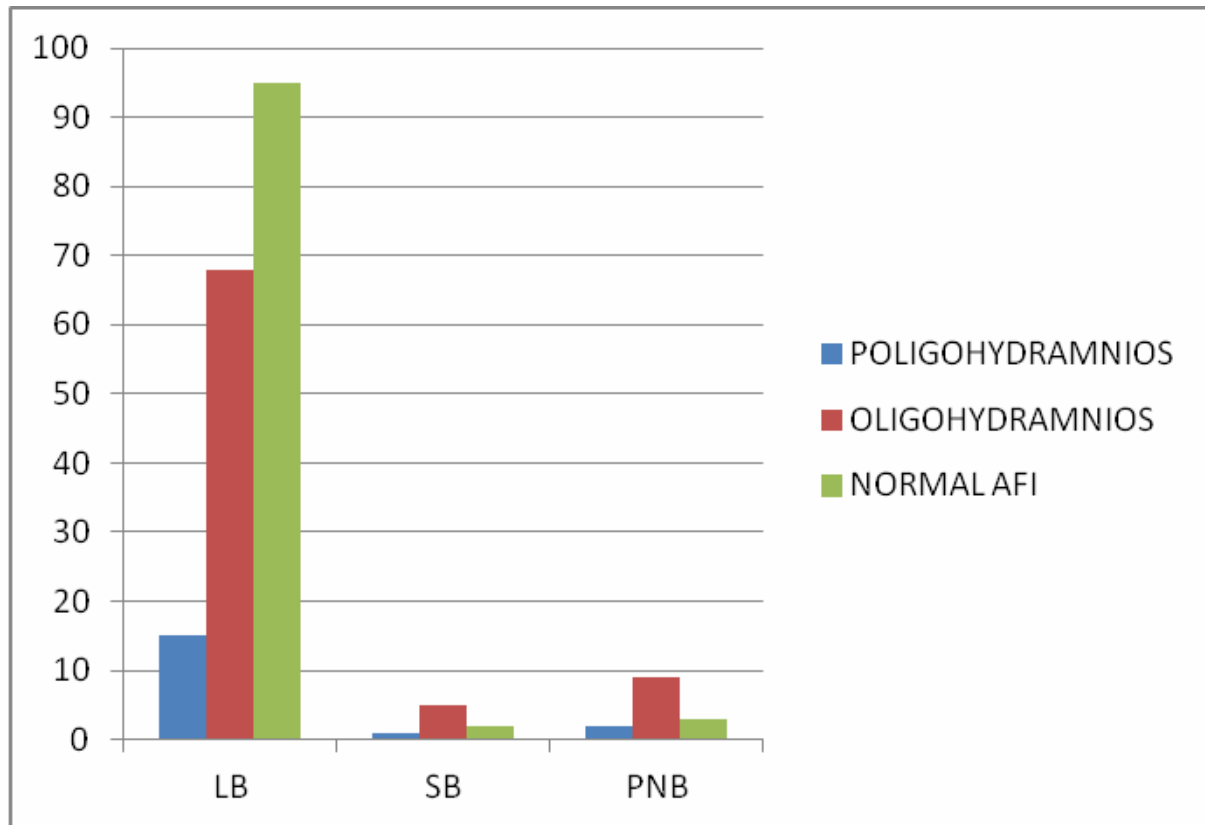
Summary

- 200 patients over a period of one year were studied. There were total 82 cases of oligohydramnios and 18 cases of polyhydramnios and 100 cases with normal AFI.
- 81% of cases in the present study of oligohydramnios were between 21 to 30 years of age, 56% of women with polyhydramnios were in the age group of 26 to 30 years.

- 53% cases of oligohydramnios were of primigravida, 77% of cases of polyhydramnios were of multigravida, so polyhydramnios was more common

multi gravida, and incidence of oligohydramnios was more common in primigravida patients.

Graph – 7: Perinatal outcome in study population.



- 49.4% cases of oligohydramnios occurred in the 37 to 40 weeks and 66.67% of polyhydramnios occurred in the 37 to 40 weeks. So both were common in late 3rd trimester.
- In oligohydramnios, there were total 68 (83%) cases of vertex presentation, 12 (14.6%) cases of breech presentation, 2 (2%) cases of transverse lie. So there were 18% chances of abnormal presentation in case of oligohydramnios as compared to 10% chances with normal AFI. In case of polyhydramnios there were total 11 (61%) cases of vertex presentation, and 7 (39%) cases with abnormal presentation, so there were 39% chances of abnormal

presentation compared to 10 % in case with normal AFI.

- In case of oligohydramnios 15 (18%) cases presented with decrease fetal movement, 13 (15%) cases presented with leaking per vaginum, 11(13%) cases presented with abdominal pain, 30 (36%) cases diagnosed clinically or by USG. In case of polyhydramnios, 2 (11%) cases presented with leaking per vaginum, 8 (44%) cases presented with abdominal pain, 2(11%) cases presented with pressure symptoms, 5 (28%) cases diagnosed by ultrasound. So, majority of patients with oligohydramnios at the time of presentation were symptomless which were diagnosed clinically or by ultrasonography, and majority of patients

of polyhydramnios were presented with abdominal pain.

- The cause of oligohydramnios is idiopathic accounting for 48% of total cases and 2nd most common etiological factor is preeclampsia in 17% of cases, followed by post datism in 14% of cases, congenital anomalies were found in 4% of cases. Anemia, thyroid disorder, diabetic mellitus contributes to 2%, 1% and 1% cases respectively. For polyhydramnios 55.5% of cases were idiopathic type 17% of cases were due to congenital anomalies of fetus, 11% of cases were due to diabetes. Pre eclampsia Rh incompatibility and post date accounting for 5% of cases each.
- In ultrasonography 154 cases had full term maturity and 46 cases were preterm 82 cases had AFI ≤ 5 cm, 18 cases had AFI ≥ 24 , and 100 cases had AFI between 6-23. Congenital anomalies were found in 7 cases.
- In this study, out of 82 patients of oligo 52 (63.4%) cases had underwent LSCS, 30 (36.5%) cases had vaginal delivery. Out of these 52 cases that underwent LSCS most of them are due to fetal distress or meconium stained liquor and out of 18 patients of polyhydramnios 3 (17%) had LSCS and 15 (83.3%) had vaginal delivery.
- In present study, 83% of babies were live of abnormal AFI, 6% babies were still birth, and 11% babies were PNM. Out of this 17% of fetal mortality most of them are due to meconium aspiration syndrome and rest are due to prematurity.

Conclusion

Thus from our study we concluded that amniotic fluid index assessment has become an important part of ante-partum fetal surveillance and also it has a prognostic value for fetal and newborn outcome. With advent of ultrasonography, the incidence of oligohydramnios seems to be on rise

since almost all cases diagnosed nowadays which were previously undetected, and incidence of polyhydramnios decreases because of early detection of anomalies like anencephaly by ultrasonography. With measuring AFI, many a times we can predict the neonatal outcome in the form of anomalies or maturity or intra-partum asphyxia and according to that we can do necessary intervention at proper time to improve perinatal outcome. Ultrasonographic measurement of AFI is a predictor of fetal outcome especially fetal tolerance during labour. With the aid of antenatal Doppler study, antenatal assessment of fetus has vastly improved. Decrease in amniotic fluid is associated with intra-partum asphyxia, fetal distress, meconium stained liquor, so by planning elective cesarean section at proper time or by doing guided induction we can improve neonatal outcome.

Polyhydramnios is associated with atonic PPH in 11.1% of cases so by knowing the amount of liquor we can predict this major complication in post partum period by taking preventing actions we can decrease its incidence. By measuring AFI many a times we can predict some hidden anomalies like tracheoesophageal fistula in case of oligohydramnios and post urethral valve in case of oligohydramnios and according to that we can take necessary actions in post partum period. Thus USG and Doppler have revolutionized the diagnosis and management of patients with abnormal AFI. Timely intervention by an obstetrician definitely will help in improving perinatal outcome.

References

1. American College of Obstetricians and Gynecologists: Amnioinfusion does not prevent meconium aspiration syndrome. *Obstet Gynecol*, 2006; 108: 1053.
2. Deka D, Malhotra B. Role of maternal oral hydration in increasing amniotic fluid volume in pregnant women with oligohydramnios. *Int J Gynaecol*, 2001; 73: 155.

3. Furman B, Erez O, Senior L, et al. Hydramnios and small for gestational age: Prevalence and clinical significance. *Acta Obstet Gynecol Scand*, 2000; 79: 31.
4. Galea P, Barigye O, Wee L, et al. The placenta contributes to activation of the renin angiotensin system in twin-twin transfusion syndrome. *Placenta*, 2008; 29(8): 734.
5. Hinh ND, Ladinsky JL. Amniotic fluid index measurements in normal pregnancy after 28 gestational weeks. *Int J Gynaecol Obstet*, 2005; 91:132.
6. Johnson JM, Chauhan SP, Ennen CS, et al. A comparison of 3 criteria of oligohydramnios in identifying peripartum complications: A secondary analysis. *Am J Obstet Gynecol*, 2007; e1: 197- 207.
7. Leung WC, Jouannic JM, Hyett J, et al. Procedure-related complications of rapid amniodrainage in the treatment of polyhydramnios. *Ultrasound Obstet Gynecol*, 2004; 23:154.
8. Liu H, Zheng Z, Wintour EM. Aquaporins and fetal fluid balance. *Placenta*, 2008; 29: 840.
9. Machado MR, Cecatti JG, Krupa F, et al. Curve of amniotic fluid index measurements in low risk pregnancy. *Acta Obstet Gynecol Scand*, 2007; 86: 37.
10. Magann EF, Chauhan SP, Bofill JA, et al. Comparability of the amniotic fluid index and single deepest pocket measurements in clinical practice. *Aust NZ J Obstet Gynaecol*, 2003; 43:75.
11. Magann EF, Chauhan SP, Doherty DA, et al. A review of idiopathic hydramnios and pregnancy outcomes. *Obstet Gynecol Surv*, 2007; 62: 795.
12. Magann EF, Chauhan SP, Martin JN. Is amniotic fluid volume status predictive of fetal acidosis at delivery? *Aust NZ J Obstet Gynaecol*, 2003b; 43: 129.
13. Magann EF, Doherty DA, Chauhan SP, et al. How well do the amniotic fluid index and single deepest pocket indices (below the 3rd and 5th and above the 95th and 97th percentiles) predict oligohydramnios and hydramnios? *Am J Obstet Gynecol*, 2004; 190: 164.
14. Nordin NM, Wei JW, Naing NN, et al. Comparison of maternal-fetal outcomes in gestational diabetes and lesser degrees of glucose intolerance. *J Obstet Gynaecol Res*, 2006; 32(1): 107.
15. Touboul C, Boileau P, Picone O, et al. Outcome of children born out of pregnancies complicated by unexplained polyhydramnios. *BJOG*, 2007; 114: 489.
16. Wang S, Amidi F, Yin S, et al. Cyclic adenosine monophosphate regulation of aquaporin gene expression in human amnion epithelia. *Reprod Sci*, 2007; 14: 234.
17. Zhang J, Troendle J, Meikle S, et al. Isolated oligohydramnios is not associated with adverse perinatal outcomes. *BJOG*, 2004; 111: 220.