

Study of Amniotic Fluid Index and Feto Maternal Outcome in Term Pregnancy at Tertiary Care Centre

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Abstract: **Background:** Amniotic fluid performs several functions during the intrauterine life. Abnormalities of amniotic fluid volume may provide valuable information to enhance fetal health assessment. Any variation in the amniotic fluid volume warrants antenatal foetal surveillance. **Methods:** This is a prospective observational comparative study conducted in the Department of Obstetrics and Gynaecology, Santhiram Medical College, Nandyal from October 2021 to April 2022. 150 pregnant women between 37 to 40 weeks of gestation were included in the study. . Pregnant women were divided into 3 groups' i. e. normal liquor, oligohydramnios and polyhydramnios. All the women were closely monitored during labour and puerperium. Follow - up was done till 7 days post - delivery, Maternal and neonatal data were collected. **Results:** Among 150 subjects, 109 had Normal AFI, 30 had Oligohydramnios and 11 had Polyhydramnios, majority of subjects of Oligohydramnios (14%) and normal AFI (73%) had gestational age between 39 - 39.6 weeks and Polyhydramnios (25%) had gestational age 37 - 37.6 weeks. Incidence of Cesarean section (60%), Fetal distress (95.6%), Meconium stained liquor (23.3%), low 1 minutes APGAR, low birth weight (32.8%), IUGR (29.7%) and NICU admission (35.9%) were common in Oligohydramnios group. Incidence of Cesarean section (72.73%), Fetal distress (54.5%), low 1 minutes APGAR, Macrosomia (32.8%), Gestational diabetes mellitus (26.7%) and NICU admission (33.3%) were common in Polyhydramnios group. **Conclusion:** Liquor assessment at term is necessary, as it indicates fetal well being & Abnormal liquor volumes at term are associated with increased maternal morbidity and adverse perinatal outcome.

Keywords: Amniotic fluid index; AFI; Oligohydramnios; Polyhydramnios; Perinatal outcome; Ultrasonography; Liquor assessment.

1. Introduction

Amniotic fluid is a highly complex and dynamic system that is studied as a data point to interpret fetal wellbeing. The Amniotic fluid starts its origin from the maternal plasma by transudation as early as from the seventh week of gestation. Its amount varies throughout the pregnancy. The Amniotic fluid performs several functions during the intrauterine life. It helps to shape the fetal skeleton normally by creating the physical space, promotes fetal lung maturation and protects the umbilical cord from the compression during labour. Too much or too little amount of amniotic fluid is the most common clinically detectable intrinsic abnormality¹.

In 1950, Prof. Sir. Ian Donald was the first to demonstrate and document the application of ultrasound to medical diagnosis². In modern obstetrics, ultrasound is an integral part of the obstetrician's armamentarium - almost an extension of the examining finger, because of its non invasive nature, accuracy and repeatability.

Amniotic fluid index (AFI): This method was proposed by Phelan JP et al³ in 1987.

It is a more objective and reproducible method as it estimates the amniotic fluid in four quadrants. The uterus is arbitrarily divided into four quadrants by the umbilicus transversely and linea nigra vertically. The deepest vertical pocket with no loops of cord and free of fetal parts in each quadrant is measured and it is summed up to give the AFI.

Pockets are measured perpendicular to the floor with the patient in supine position.

AFI of 5 - 18 cm is considered normal, AFI of 18cm or greater is Polyhydramnios or less than 5cm is Oligohydramnios. Recently Oligohydramnios has been defined as less than 3rd and 5th percentile and hydramnios more than 95th and 97th percentile for gestational age. The reliability of correctly identifying Oligohydramnios or Polyhydramnios using the percentiles is similar to SDVP (2 - 8) and AFI (5 - 18). Therefore the present study was conducted to find out the maternal and perinatal outcome and to identify the possible causes of Abnormal liquor volume.

Objectives

- 1) To study the Amniotic Fluid Index in term pregnancies
- 2) To Evaluate Fetomaternal outcome in different volumes of Amniotic Fluid

2. Methodology

Study setting: Department of Obstetrics and Gynaecology, Santhiram medical college, Nandyal.

Study period: 7 months study period. Study was conducted from October 2021 to April 2022

Sampling method

All pregnant women with term pregnancy admitted to labour room who fulfilled the inclusion criteria were selected for

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the study. All patients were subjected for ultrasound examination to study Amniotic Fluid index. Fetomaternal outcome was studied in different volumes of Amniotic Fluid.

Sample size

During the study period of 7 months from october 2021 to april 2022, a total of 150 cases were enrolled as per inclusion criteria out of which 109 cases were with normal AFI, 30 cases of Oligohydramnios and 11 cases of Polyhydramnios.

Method of data collection

The study includes pregnant women with gestational age 37 to 40 weeks admitted in labour room at department of OBG, santhiram medical college, nandyal.

Written informed consent was taken from the subjects, Form F was filled accordingly.

Inclusion Criteria

- 1) Single live intrauterine gestation
- 2) Gestational age 37 to 40 weeks of gestation
- 3) Intact membrane.

Exclusion criteria

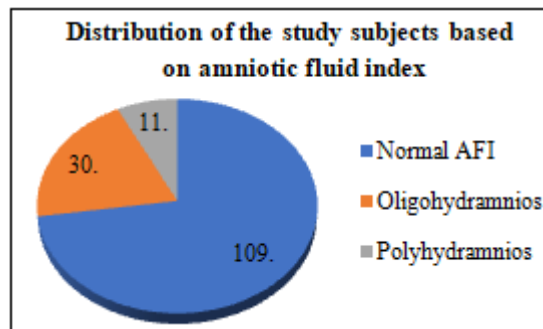
- 1) Gestational age <37 completed weeks
- 2) Post dated pregnancy
- 3) Ruptured membranes
- 4) Uterine scar due to previous lower segment caesarean section (LSCS), myomectomy, hysterotomy.
- 5) Multiple Gestation

Pregnant women with gestational age 37 to 40 weeks who fulfilled inclusion criteria were enrolled into our study.

3. Result

Table 1: Distribution of the study subjects based on amniotic fluid index

Category	Frequency	Percentage
Normal AFI	109	72.67%
Oligohydramnios	30	20.00%
Polyhydramnios	11	7.33%
Grand Total	150	100.00%



Of the 150 subjects, Ultrasonographically 110 subjects had normal AFI (73.3%), 29 subjects had Oligohydramnios (19.3%) and 11 subjects had Polyhydramnios (7.3%)

Table 2: Gestation wise distribution of the study subjects among the groups

Gestational age	Normal, n (%)	Oligohydramnios, n (%)	Polyhydramnios, n (%)	Total
37 - 37+6 weeks	13 (54.17%)	6 (25%)	5 (20.83%)	24
38 - 38+6 weeks	23 (65.71%)	10 (28.57%)	2 (5.71%)	35
39 - 40 weeks	73 (80.22%)	14 (15.38%)	4 (4.40%)	91
Total	109	30	11	150

In our study majority of the subjects that is 80.2% of normal AFI, 15.38% of Oligohydramnios, were between 39 to 40 weeks of gestation and 25% of oligohydramnios, 20.83% of polyhydramnios were between 37 to 37.6 weeks of gestation

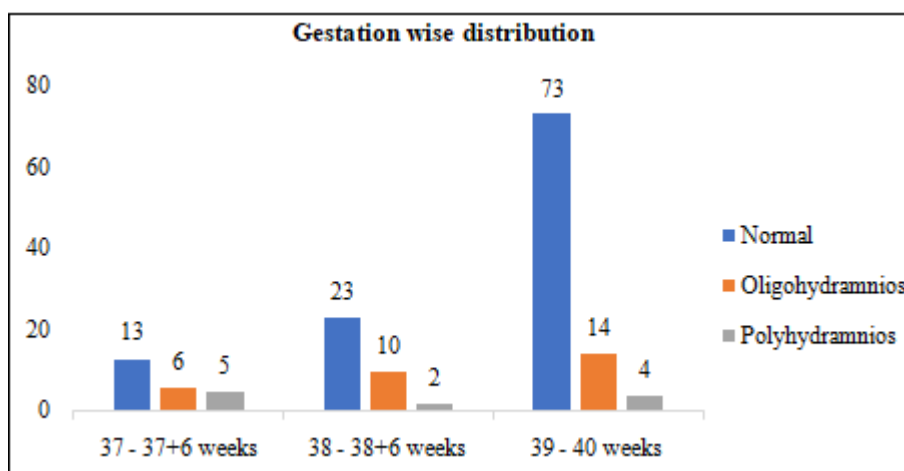


Table 3: Distribution of study subjects based on mode of delivery among the groups

Mode of delivery	Normal	Oligohydramnios	Polyhydramnios	Grand Total
LSCS	23 (21.10%)	18 (60%)	8 (72.73%)	49 (32.67%)
Vaginal	86 (78.90%)	12 (40%)	3 (27.27%)	101 (67.33%)
Grand Total	109	30	11	150

P value: 0.03 (significant)

This table shows that majority of subjects that is 72.73% of Polyhydramnios, 60% of Oligohydramnios had LSCS compared to 23% of normal AFI group and maximum number of subjects that is 86% of normal AFI had vaginal delivery compared to 12% of Oligohydramnios, 3% Polyhydramnios which is statistically significant

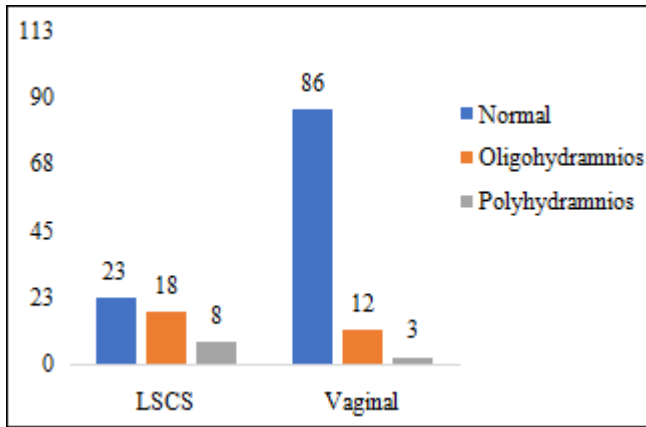


Table 4: Indication of LSCS in the study subjects among the groups

Indication of LSCS	N	O	P	Grand Total
Arrest of Descent	3 (60)		2 (40)	5
Breech	1 (100)			1
CPD	3 (75)	1 (25)		4
2 nd stage arrest	1 (100)			1
Deep Transverse Arrest		1 (100)		1
Fetal distress	15 (41)	16 (44.44)	5 (13.8)	36
non progression of labour	86 (84.3)	12 (11.7)	4 (3.92)	102
Grand Total	109 (72.67)	30 (20)	11 (7.33)	150

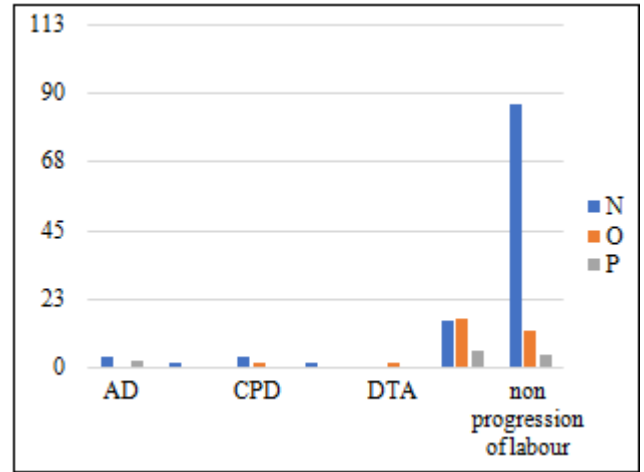


Table 5: Co - morbid conditions in study subjects among the groups

Complications	N	O	P	Grand Total
A	4 (3.67)		1 (9)	5 (3.33)
A, PE	1 (0.92)			1 (0.67)
A, RN	1 (0.92)			1 (0.67)
Anaemia	1 (0.92)			1 (0.67)
GDM			2 (18.18)	2 (1.33)
GH	2 (1.83)	1 (3.33)		3 (2)
HBSAg +	1 (0.92)	2 (6.67)		3 (2)
Hypothyroid		1 (3.33)		1 (0.67)
MA	1 (0.92)			1 (0.67)
MA, SPE	1 (0.92)			1 (0.67)
MPE	7 (6.42)	2 (6.67)	1 (9)	10 (6.67)
NIL	78 (71.5)	21 (70)	7 (63.64)	106 (70.67)
PE	7 (6.42)	2 (6.67)		9 (6)
PE, RN	1 (0.92)	1 (3.33)		2 (1.33)
RN	1 (0.92)			1 (0.67)
SA	2 (1.83)			2 (1.33)
SPE	1 (0.92)			1 (0.67)
Grand Total	109	30	11	150

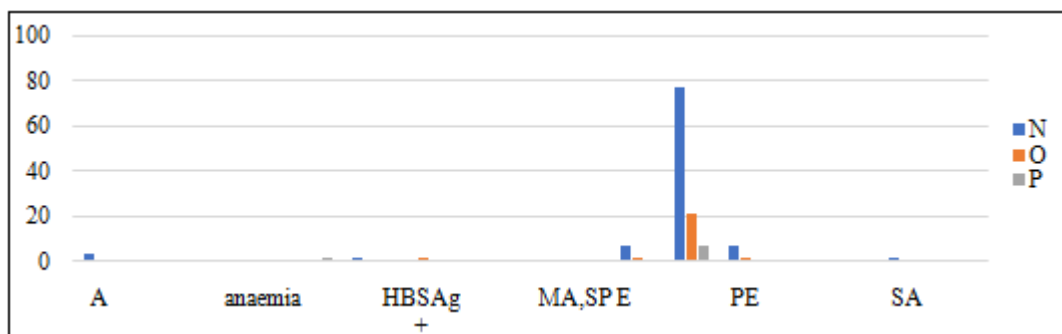
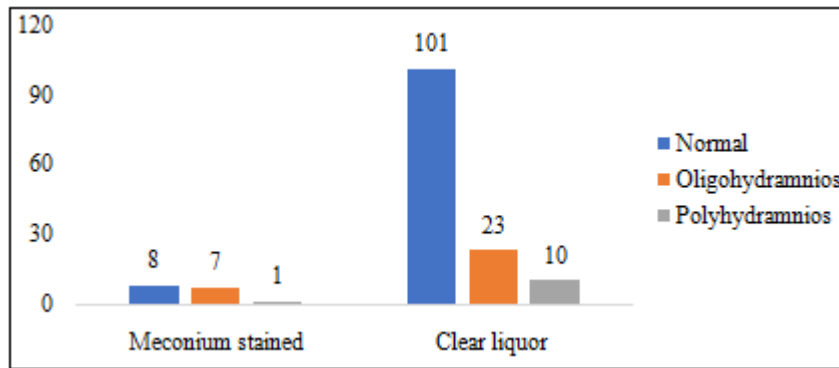


Table 6: Distribution of the study subjects based on colour of liquor among the groups

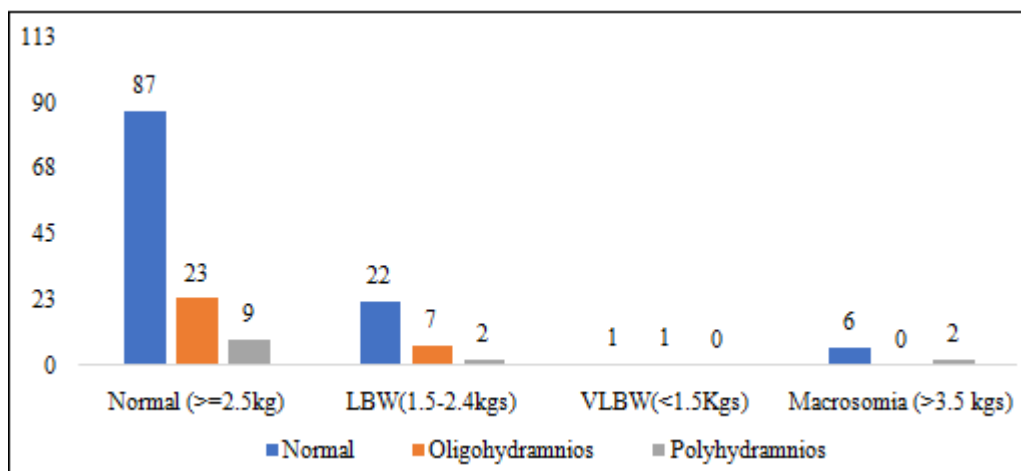
Colour of liquor	Normal	Oligohydramnios	Polyhydramnios	Grand Total
Meconium stained	8 (7.34%)	7 (23.33%)	1 (9.09%)	16 (10.67%)
Clear liquor	101 (32.6%)	23 (76.67%)	10 (90.91%)	134 (89.33%)
Grand Total	109	30	11	150



This table shows that among the subjects 23.3% in Oligohydramnios, 9% in Polyhydramnios had meconium stained liquor compared 7.34 % in normal AFI group for which P value is <0.001 which is statistically significant

Table 7: Birth weight of the newborns among the groups

Birth weight	Normal	Oligohydramnios	Polyhydramnios	Grand Total
Normal (≥ 2.5 kg)	87 (79)	23 (20.7)	9 (6.3)	119
LBW (1.5 - 2.4kgs)	22 (70)	7 (22.5)	2 (25)	31
VLBW (<1.5Kgs)	1 (12)	1 (22.5)	0 (0)	2
Macrosomia (>3.5 kgs)	6 (20)	0 (0)	2 (25)	8



Majority of subjects that is 79% in normal AFI, 20.7% in Oligohydramnios, 6.3% in Polyhydramnios had birth weight of the babies in normal range (≥ 2.5 Kg)

22.5% of Oligohydramnios had low birth weight for their babies (1.5 - 2.4kgs) compared to 70% of normal AFI & 25% of Polyhydramnios which is statistically significant p value <0.001 which is statistically significant

Table 8: APGAR scores in the newborns among the groups

	Normal	Oligohydramnios	Polyhydramnios	Grand Total
Apgar at 1 min				
Low apgar	14 (12.84%)	4 (13.33%)	3 (27.27%)	21 (14%)
Normal apgar	95 (87.16%)	26 (86.67%)	8 (72.73%)	129 (86%)
Grand Total	109	30	11	150
Apgar at 5 min				
Normal	109 (100%)	30 (100%)	11 (100%)	150
Low	0	0	0	0
Grand Total	109	30	11	150

Among the study subjects 12.8% of Oligohydramnios, 27.2% of Polyhydramnios had low Apgar score at 1 minute compared to 12.8% of normal AFI which is statistically significant

100% in normal AFI, 100% in Oligohydramnios, 100% in Polyhydramnios group had normal APGAR score at 5 minutes which is statistically not significant

Table 9: NICU admission of newborns among the groups

NICU admission	Normal	Oligohydramnios	Polyhydramnios	Grand Total
No	100 (91.7%)	25 (83.33%)	9 (81.82%)	134 (89.33%)
Yes	9 (8.26%)	5 (16.67%)	2 (18.18)	16 (10.67%)
Grand Total	109	30	11	150

Among the study groups 83.33 % of Oligohydramnios & 18.18% of Polyhydramnios compared to 8.26% of normal AFI new borns born were admitted in NICU which is statistically significant

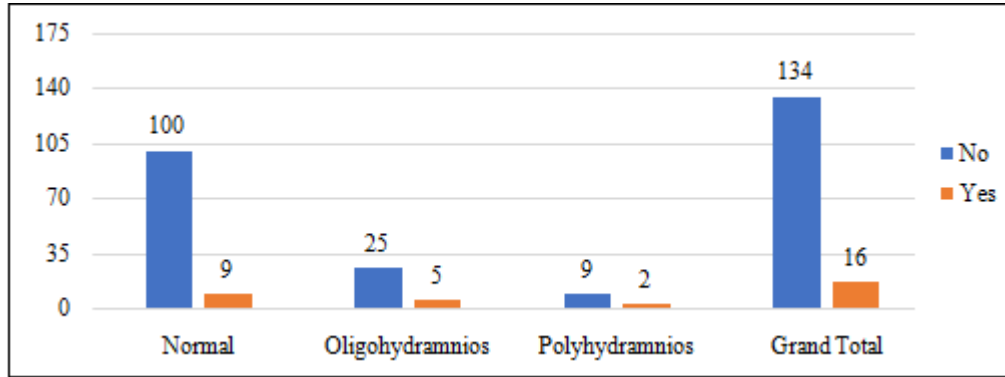
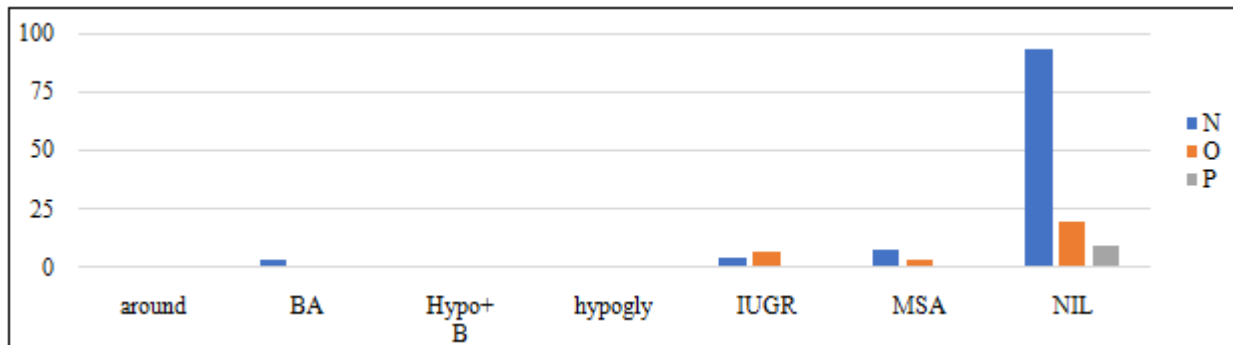


Table10: Neonatal complications in study subjects among the groups

Neonatal Complication	Normal	Oligohydramnios	Polyhydramnios	Grand Total
Yes	16 (14.6)	10 (33.3)	2 (18.8)	28 (18.6)
No	93 (85.32)	20 (66.7)	9 (81.8)	122 (81.3)
Grand Total	109	30	11	150

Table 11: Neonatal Complications

Neonatal complications	N	O	P	Grand Total
Cord Around neck	1 (0.92)			1
BA	3 (2.75)			3
Hypothyroidism Big baby			1 (9.09)	1
Hypoglycemia			1 (9.09)	1
IUGR	4 (3.67)	7 (23.3)		11
MSA	8 (7.34)	3 (10)		11
NIL	93 (85.32)	20 (66.7)	9 (81.82)	122
Grand Total	109	30	11	150



4. Discussion

It has been widely accepted that with standard antenatal care and early detection of abnormal liquor volume has reduced the neonatal complications

Oligohydramnios with AFI ≤ 5cm can lead to an increase in perinatal mortality and morbidity. Under these conditions, there is increased frequency of meconium stained liquor, fetal distress, low apgar scores, abnormal Fetal heart rate patterns.

Polyhydramnios with AFI>25 cm can lead to an increased maternal & perinatal morbidity & mortality.

Various studies have been presented to know the perinatal morbidity and mortality in pregnancy with Abnormal liquor volume. In the same way our study was tried to reveal the fetomaternal outcome in Normal liquor volume, Oligohydramnios & Polyhydramnios in our department of Obstetrics and Gynaecology, Santhiram medical college, nandyal.

In our study total number of cases studied were 150, amongst that 109 were of normal AFI (73%), Oligohydramnios were 30 (14%) which is comparable with Umber et al 2003⁴ in which 70% were with normal AFI & 29% were with Oligohydramnios. In present study Polyhydramnios was 11 (25%) compared to Neetu Meena et al⁵ (1.4%) is more.

In our study mean age of gestation was >38.9±0.96 weeks in all the groups which is comparable with Pradeep R Gaikwad et al 2016⁷ in his study Mean gestational age was 37.95±2.29 weeks.

In our study, 14% were Preeclampsia & 1.83% were gestational hypertension in Normal AFI group, 10.3% were preeclampsia, 3.33% were Gestational hypertension in Oligohydramnios group, 9.09% were preeclampsia & 0% were Gestational hypertension in Polyhydramnios group as compared to Shubhadeep et al⁶, Pradeep R Gaikwad et al 2016⁷, Guin G et al study⁸

Hypertensive Disorders in pregnancy	Shubhadeep et al ⁶	Pradeep R Gaikwad et al 2016 ⁷	Guin G et al ⁸	Present study
Oligohydramnios	30%	34.60%	3.50%	17%
Polyhydramnios	-	-	17.70%	9%
Normal AFI	26%	27.40%	-	16%

In our study, GDM were present in 18% in Polyhydramnios group as compared to Guin G et al⁸ study where 20% cases were GDM and 5% cases were GDM in Vaid S et al⁹ study.

In our study, 2% in Normal AFI & 3.3% in Oligohydramnios group were Rh negative pregnancy as compared to Guin G et al⁸ where Rh negative pregnancy were 4.4% & Shubhadeep et al⁶ i. e 6% in Oligohydramnios & 2% in Normal AFI group.

In our study, Severe anemia were present in 1.8% in normal AFI group which is comparable with Pradeep R Gaikwad et al 2016⁷ 1.9% in normal AFI group.

In Oligohydramnios group 40% had vaginal delivery Pradeep R Gaikwad et al 2016⁷, Shubhadeep et al⁶ (16% Spontaneous & 22% Induced vaginal delivery)

In Polyhydramnios group 27.27% had vaginal delivery which is less when compared with Guin G et al⁸ (86.6% spontaneous vaginal & 13.3% induced)

Vaginal delivery	Pradeep R Gaikwad et al 2016 ⁷	Guin G et al ⁸	Present study
Oligohydramnios	26.40%	-	40%
Polyhydramnios	-	86.60%	27.27%
Normal AFI	62.40%	-	78.90%

Meconium stained liquor was present in 9.09% in Polyhydramnios group, 7.34% of Normal group & 23.33% in Oligohydramnios group which is comparable with Shubhadeep et al⁶ & Pradeep R Gaikwad et al 2016⁷

Meconium stained Liquor	Shubhadeep et al ⁶	Pradeep R Gaikwad et al 2016 ⁷	Present study
Oligohydramnios	48%	36.70%	23.30%

Polyhydramnios	-	-	9.09%
Normal AFI	12%	25.40%	7.34%

Caesarean section:

21.1% of normal AFI group had Caesarean section which is less when compared with Pradeep R Gaikwad et al 2016⁷ (37.7%)

The indication for LSCS were, 60% had Arrest of descent & 75% Cephalopelvic disproportion, 41% had Fetal distress, 84% non progress of labour & second stage arrest as the cause for LSCS 60% had LSCS in Oligohydramnios group which is comparable with Pradeep R Gaikwad et al 2016⁷ (73.4%) and the indications were fetal distress majority of the cases had this indication (95.6%) which is comparable with Shubhadeep et al⁶ (70% fetal distress), Guin G et al⁸ (80% fetal distress). 2.2% had cephalopelvic disproportion & deep transverse arrest as the indication 72.73% had LSCS in Polyhydramnios which is significantly more when compared with Neetu Meena et al⁵ (25%) The indications were 13.8% had Fetal distress as the major causes 40% had Arrest of descent & cephalopelvic disproportion, 3.92% had non progress of labour which is comparable with Neetu Meena et al⁵ (10%)

LSCS	Neetu Meena et al ⁵	Pradeep R Gaikwad et al 2016 ⁷	Present study
Oligohydramnios	-	73.40%	60%
Polyhydramnios	25%	-	72.73%
Normal AFI	-	37.20%	21.10%

Neonatal Outcome

In this study majority of the subjects had normal weight babies (>2.5kg), 77.4% in normal AFI, 65.6% in Oligohydramnios which is comparable with Umber A⁴ study (80.7% normal AFI, 61% Oligohydramnios) 66.7% in Polyhydramnios group

Low birth weight babies (1.5kg - 2.5kg) were 18.6% in normal AFI, 32.8% in Oligohydramnios, 13.3% in Polyhydramnios group which is comparable with Shubhadeep et al⁶ & Chate P et al¹⁰

Low birth weight	Shubhadeep et al ⁶	Chate P et al ¹⁰	Present study
Oligohydramnios	42%	62%	22.50%
Normal AFI	12%	28%	70%
Polyhydramnios	-	-	25%

Macrosomia (>3.5kg) were seen in 25% of Polyhydramnios & 20% in normal AFI group which is comparable with umber A et al⁴ (10%)

Mean birth weight among the study subjects were 2.76±0.39 in normal AFI, 2.54±0.47 in Oligohydramnios, 3.03±0.55 in Polyhydramnios group which is statistically significant

APGAR score at 1 minute were normal in 87.16% of normal AFI, 86.67% in Oligohydramnios, 72.73% in Polyhydramnios

Low APGAR at 1 minute were 12.84% in normal AFI, 13.3% in oligohydramnios, 27.27% in Polyhydramnios

group which is comparable with Chate P et al¹⁰, Pradeep R Gaikwad et al 2016⁷

APGAR 1 min (<7)	Chate P et al ¹⁰	Pradeep R Gaikwad et al 2016 ⁷	Present study
Oligohydramnios	30%	26.50%	13.30%
Polyhydramnios	-	-	27.27%
Normal AFI	18%	11.70%	12.84%

After resuscitation APGAR score at 5 minutes were 100% normal in normal AFI, 100% in Oligohydramnios & Polyhydramnios group. NICU admission required in the study subjects were 8.26% in normal AFI, 16.67% in Oligohydramnios, 18.8% in Polyhydramnios group which is comparable with Chate P et al¹⁰, Pradeep R Gaikwad et al 2016⁷.

NICU admission	Chate p et al ¹⁰	Pradeep R Gaikwad et al 2016 ⁷	Present study
Oligohydramnios	42%	28.50%	16.67%
Polyhydramnios	-	-	18.80%
Normal AFI	12%	19.60%	8.26%

13.1% of Normal AFI, 34.4% of Oligohydramnios, 20% of Polyhydramnios group had neonatal complications

IUGR is the most common neonatal complication associated with Oligohydramnios 23.3% compared to normal AFI (3.67%) and Polyhydramnios (0%)

IUGR	Guin G et al ⁸	Pradeep R Gaikwad et al 2016 ⁷	Present study
Oligohydramnios	14.20%	44.80%	23.30%
Normal AFI	11.40%	13.70%	3.67%

Macrosomia is the most common neonatal complication associated with Polyhydramnios (9.09%) compared to normal AFI (0%) and Oligohydramnios (0%)

Fetal hypoglycaemia was present in 9.09% of Polyhydramnios & none of the babies had fetal hypoglycemia in normal AFI group & Oligohydramnios.

5. Conclusion

Abnormal liquor volume is being detected more often these days due to increase in booking status of cases and routinely performed obstetric USG.

Oligohydramnios is one of the indicators of poor perinatal outcome because of its association with Fetal heart rate abnormalities, Meconium staining of amniotic fluid, umbilical cord compression, poor tolerance of labour, increased Cesarean rate for fetal distress, low birth weight and low APGAR score, increased NICU admission and neonatal mortality.

Polyhydramnios is also the indicators of poor perinatal outcome because of its association with Fetal heart rate abnormalities, Gestational diabetes mellitus umbilical cord prolapse, poor tolerance of labour, increased Cesarean rate for fetal distress and CPD, Macrosomia and low APGAR score, increased NICU admission and neonatal mortality.

From this study, we conclude that cases with abnormal liquor volume is a high risk pregnancy which requires proper antepartum care and intensive fetal surveillance in both antepartum and intrapartum period and good neonatal care necessary for better perinatal outcome.

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KEY WORDS

AFI – Amniotic fluid index
 P – Polyhydramnios
 O – Oligohydramnios
 N – Normal
 A – Anemia
 SPE – Severe Pre Eclampsia
 PE – Pre Eclampsia
 RN – Rh Negative
 GDM – Gestational Diabetes mellitus
 GH – Gestational Hypertension
 MA – Moderate Anemia