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Research Article

A comparative analytical study of clinical outcome of oligohydramnios at or beyond 34 weeks of gestation

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ABSTRACT

Background: Amniotic fluid volume measurement forms an integral part of the antenatal fetal monitoring. It is widely used as an indicator of fetal wellbeing during third trimester. The four quadrant method of calculating AFI as described by Phelan et al is accepted by most of the authors. Oligohydramnios in pregnancy without a renal abnormality or genitourinary obstruction represents "chronic in utero stress". Perinatal morbidity and mortality are significantly increased in oligohydramnios. So oligohydramnios was taken up for further study in order to devise methods and means to know the cause, diagnose and manage it in a better way. The aim of the study was to study the maternal and perinatal outcome in oligohydramnios at or beyond 34 weeks of gestation.

Methods: This comparative analytical study was done in pregnant women with AFI < 5cm diagnosed at/after 34 weeks of gestation attending antenatal clinic at department of OBG, Shri Dharmasthala Manjunatheshwara College of Medical Sciences and Hospital, Dharwad from November 2012 to October 2013. Clinical outcome was compared with pregnant women having normal AFI (6-24 cm) at/after 34 weeks of gestation. For all women AFI and NST were done. UAD was done in women with oligohydramnios. Patients with abnormal NST and/or Doppler studies at the time of diagnosis or any time during fetal surveillance were considered for termination of pregnancy. In pregnant women with normal AFI, NST was done once in two weeks or as necessity demanded. Various clinical outcomes were measured using appropriate statistical measurements.

Results: In presence of oligohydramnios, the occurrence of non-reactive NST, meconium stained liquor, development of fetal distress, LSCS rate; low Apgar score, low birth weight babies, NICU admissions and early neonatal deaths were high.

Conclusions: Determination of AFI is a valuable parameter, which can be used as an adjunct to other fetal surveillance methods. It helps to identify neonates at risk of poor perinatal outcome.

Keywords: Amniotic fluid index, Oligohydramnios, Caesarean section, Non-stress test, Fetal distress, Perinatal mortality

INTRODUCTION

Amniotic fluid volume measurement forms an integral part of the antenatal fetal monitoring, which is a part of routine obstetric scan. It is widely used as an indicator of fetal wellbeing during third trimester. Although subjective and semi quantitative methods of estimating amniotic fluid volume ultrasonographically are in use, best method remains controversial. However, the technique of four quadrant method of calculating amniotic fluid index as described by Phelan et al is accepted by most of the authors.[1]

Reported incidence varies between 0.5% to >5% depending on definition of oligohydramnios and population studied. Phelan who described amniotic fluid index (AFI), defined oligohydramnios as AFI less than 5 cm.[2] Oligohydramnios in a pregnancy without a renal

abnormality or genitourinary obstruction represents "chronic in utero stress". Perinatal morbidity and mortality are significantly increased in oligohydramnios.[3]

In our study we wanted to study clinical outcome in oligohydramnios and compare them with pregnant women with normal AFI at or beyond 34 weeks of gestation. So oligohydramnios was taken up for further study in order to devise methods and means to know the cause, diagnose and manage it in a better way.

The aim of the study was to study the maternal and perinatal outcome in oligohydramnios at or beyond 34 weeks of gestation.

METHODS

This comparative analytical study was done in pregnant women with AFI <5 centimetres diagnosed at or after 34 weeks of gestation attending antenatal clinic at Department of Obstetrics and Gynaecology, Shri Dharmasthala Manjunatheshwara College of Medical Sciences and Hospital, Dharwad from November 2012 to October 2013. Clinical outcome in pregnant women with AFI <5 centimetres was compared with pregnant women having normal AFI (6-24 cm) at or after 34 weeks of gestation.

Inclusion criteria

- Gestational age between 34 weeks- 42 weeks
- Singleton gestation with cephalic presentation
- AFI $\leq$ 5 cm
- Intact membranes

Exclusion criteria

- Associated fetal malformations
- Gestational age less than 34 weeks and more than 42 weeks
- Ruptured membranes
- Multiple gestation
- Intrauterine death
- Fetal malpresentation
- Polyhydramnios

For all the selected cases with good dating, thorough history was taken and complete examination was done. Clinical evidence of oligohydramnios was looked for. The previous obstetric records and ultrasound reports were reviewed. For all women baseline investigations like blood group and Rh typing, hemoglobin, urine examination (albumin, sugar and microscopy), HIV, HBsAg and VDRL were done. For all women, ultrasound examination was done and amniotic fluid was calculated by four quadrant amniotic fluid volume measurement technique. For each case, a control was taken with similar gravidity, parity and gestational age. NST was done for all women. NST result was considered reactive if 2 accelerations of >15 beats/min (bpm) from baseline and lasting >15 seconds were present during a 20-minute period. NST was considered abnormal if baseline variability was less than 5 bpm with late decelerations or repetitive variable decelerations at least three in 20 minutes even if mild or decelerations lasting 1 minute or longer.

Umbilical artery Doppler was performed at the middle of the umbilical cord in pregnant women with oligohydramnios. This was considered abnormal if S/D ratio was above 95th percentile for corresponding gestational age or if diastolic flow was either absent or reversed.

If NST was reactive close fetal surveillance was done by biweekly NST till 37 weeks of gestation in oligohydramnios patients. Patients with abnormal NST and/or Doppler studies at the time of diagnosis or any time during fetal surveillance were considered for termination of pregnancy. In pregnant women with normal AFI, NST was done once in two weeks or as necessity demanded.

Outcomes

Maternal outcome

1. Gestational age at the time of delivery
2. Whether induction of labour was required?
3. Route of delivery : vaginal/caesarean
4. Colour of the amniotic fluid : clear/meconium stained (thin/thick)
5. NST : reactive/non-reactive
6. Umbilical artery Doppler : normal/abnormal

Perinatal outcome

1. Birth weight of the baby
2. Apgar scores at 1 minute and 5 minutes
3. Whether the baby required NICU admission?
4. Whether the baby had aspirated meconium?
5. Whether the baby had respiratory distress syndrome?
6. Early neonatal deaths

Appropriate statistical measurement like rates, ratios, percentages, proportions, mean ±SD or number were used. Also 't' test and 'chi square' test were used. P-value < 0.05 was considered statistically significant.

RESULTS

Our comparative analytical study was performed in 50 pregnant women with the AFI of < 5 cm and gestational

age of > 34 weeks. These women were compared with 50 pregnant women with normal AFI. Study and control groups were similar with variables i.e. maternal age, gravidity, parity, gestational age and antenatal complications.

The mean age for study group was 24.36 years and that of control group was 23.86 years. There was no significant difference in the mean age between two groups statistically. The age distribution is shown in Table 1.

Table 1: Age distribution in study and control groups.

Age groups (years)	Study group	%	Control group	%
18-20	6	12.00	8	16.00
21-25	28	56.00	30	60.00
26-30	13	26.00	10	20.00
31-35	3	6.00	2	4.00
Total	50	100.00	50	100.00
Mean age	24.36		23.86	
SD	3.29		3.13	
p-value	0.4379			

There was no significant difference in the gravidity between two groups statistically

Table 2: Gravidity distribution in study and control groups.

Gravidity	Study group	%	Control group	%
Gravida 1	29	58.00	29	58.00
Gravida 2	14	28.00	13	26.00
Gravida 3	3	6.00	4	8.00
Gravida 4	3	6.00	4	8.00
Gravida 5	1	2.00	0	0.00
Total	50	100.00	50	100.00
Chi-square = 0.1801 p-value = 0.9812				

Table 3: Parity distribution in study and control groups.

Parity	Study group	%	Control group	%
Nullipara	36	72.00	34	68.00
Para 1	12	24.00	13	26.00
Para 2	1	2.00	2	4.00
Para 3	1	2.00	1	2.00
Para 4	0	0.00	0	0.00
Total	50	100.00	50	100.00
Chi-square = 0.0827 p-value = 0.9571				

The mean gestational age was 38.06 weeks for study group and 38.24 weeks for control group. There was no significant difference in the distribution of gestational age between two groups statistically as shown in Table 4.

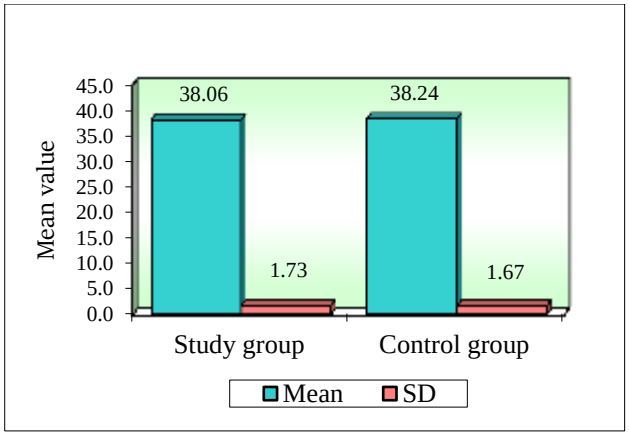

Figure 1: Comparison of mean gestational age in weeks between study and control groups.

Various antenatal complications that were noted in our study include pre-eclampsia and post-dated pregnancy. These complications occurred in 36% of women in the study group and 36% of women in the control group as shown in Table 5.

Table 4: Comparison of gestational age between study and control groups.

Gestational age (weeks)	Study group	%	Control group	%
34	1	2.0	1	2.0
35	3	6.0	2	4.0
36	5	10.0	4	8.0
37	9	18.0	9	18.0
38	12	24.0	12	24.0
39	10	20.0	11	22.0
40	5	10.0	6	12.0
41	5	10.0	5	10.0
Total	50	100.00	50	100.00
Mean	38.06		38.24	
SD	1.73		1.67	
p-value	0.5982			

Table 5: Antenatal complications in study and control groups.

Antenatal complications	Study group	%	Control group	%
Mild pre-eclampsia	5	10.00	4	8.00
Severe pre-eclampsia	3	6.00	3	6.00
Post-dated pregnancy	9	18.00	10	20.00
Post-dated pregnancy with pre-eclampsia	1	2.00	1	2.00
Total	18	36.00	18	36.00

The mean AFI in study group was 4.03 cm and in control group was 10.84 cm as shown in Table 6.

Table 6: Distribution of AFI in study and control groups.

AFI (cm)	Study group	%	Control group	%
2-3	9	18.00	-	-
3.1-4	23	46.00	-	-
4.1-5	18	36.00	-	-
5.1-8	-	-	1	2.00
8.1-11	-	-	33	66.00
11.1-14	-	-	12	24.00
14.1-17	-	-	4	8.00
Total	50	100.00	50	100.00
Mean	4.03		10.84	

The outcome parameters analysed include NST, nature of amniotic fluid, induction of labour rate, mode of delivery, occurrence of instrumental vaginal delivery and LSCS for fetal distress, Apgar score at 1 minute and 5 minutes, birth weight of the baby, NICU admission and early neonatal deaths.

The NST was non-reactive in 24 (48%) women in study group and 8 (16%) in control group. The difference in the NST pattern between the two groups was statistically significant as shown in Table 7.

Table 7: NST pattern in study and control groups.

NST	Study group	%	Control group	%
Reactive	26	52.0	42	84.0
Non-reactive	24	48.0	8	16.0
Total	50	100.0	50	100.0
Chi-square = 11.765; p-value = 0.001*; *p<0.05				

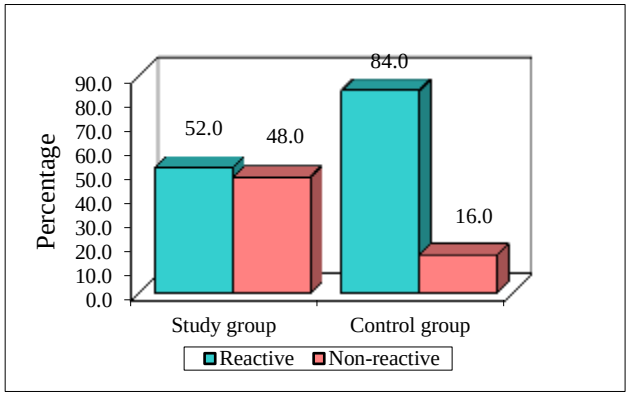

Figure 2: NST pattern in study and control groups.

The amniotic fluid was thick meconium stained in 16 (32%) and thin meconium stained amniotic fluid in 6 (12%) women of study group. In control group, 3 (6%) women had thick meconium stained amniotic fluid and 3 (6%) women had thin meconium stained amniotic fluid. The difference in occurrence of meconium stained amniotic fluid between two groups was statistically significant (p-value <0.05) as shown in Table 8.

Table 8: Nature of amniotic fluid in study and control groups.

Nature of amniotic fluid	Study group	%	Control group	%
Clear	28	56.0	44	88.0
Thin meconium	6	12.0	3	6.0
Thick meconium	16	32.0	3	6.0
Total	50	100.0	50	100.0
Chi-square = 13.450		p-value= 0.001*		

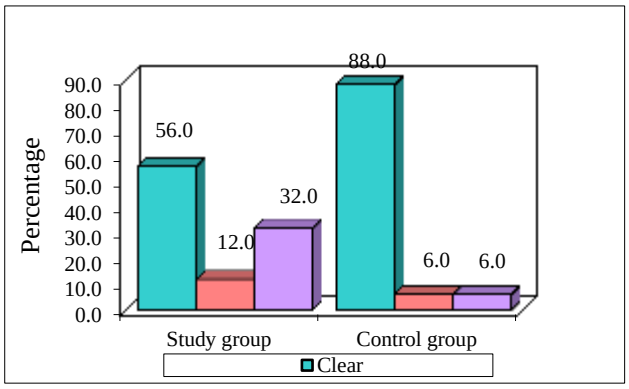

Figure 3: Nature of amniotic fluid in study and control groups.

Labour was induced in 22 (44%) women in the study group and 11 (22%) women in the control group. The difference between two groups was statistically significant (p-value <0.05) as shown in Table 9.

Table 9: Induced vs Spontaneous labour in study and control groups.

Labour	Study group	%	Control group	%
Induced	22	44.00	11	22.00
Spontaneous	6	12.00	35	70.00
Chi-square = 21.046; p-value = 0.0001*; *p<0.05				

Caesarean delivery (LSCS) was done in 30 (60%) women and instrumental vaginal delivery in 9 (18%) women in the study group. In control group, 7 (14%) women delivered by caesarean delivery and 6 (12%) women by instrumental vaginal delivery. The difference between two groups was statistically significant (p-value <0.05) as shown in Table 14.

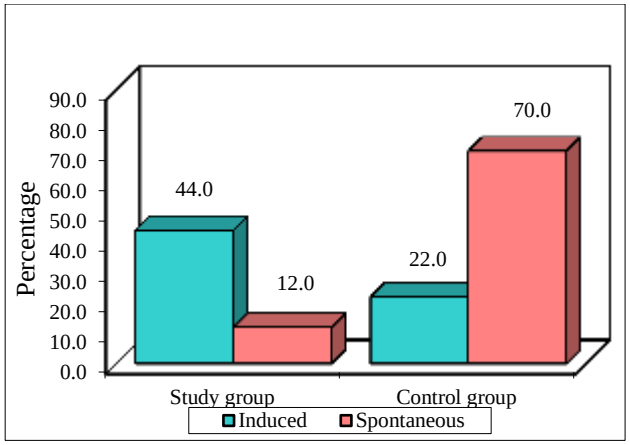

Figure 4: Induced vs Spontaneous labour in study and control groups.

Table 10: Mode of delivery in study and control groups.

Mode of delivery	Study group	%	Control group	%
Vaginal	11	22.00	37	74.00
Instrumental vaginal	9	18.00	6	12.00
LSCS	30	60.00	7	14.00
Total	50	100	50	100
Chi-square = 28.9821; p-value = 0.0001*; *p<0.05				

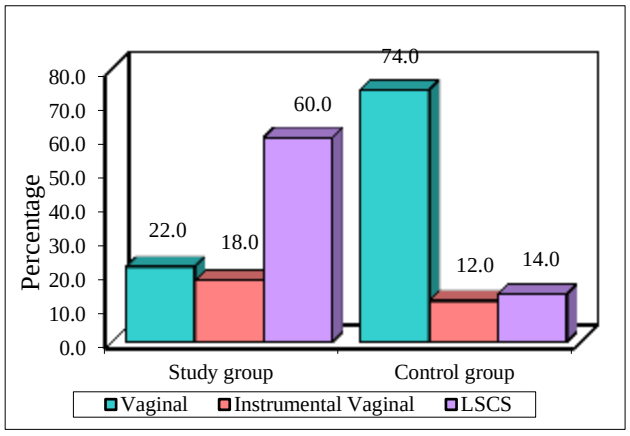

Figure 5: Mode of delivery in study and control groups.

In study group, 38 (76%) women developed fetal distress (includes women with non-reactive NST on admission or at any time during labour). Of them, 30 (60%) women delivered by caesarean delivery and 8 (16%) delivered by instrumental vaginal delivery. In control group, 12 (24%) women developed fetal distress. Of them, 7 (14%) women delivered by caesarean section and 5 (10%) delivered by instrumental vaginal delivery. Our study shows that women with oligohydramnios developing fetal distress and undergoing caesarean section was quite high though p-value was not significant as shown in Table 11.

Table 11: Interventions for fetal distress in study and control groups.

Interventions	Fetal distress in study group	%	Fetal distress in control group	%
LSCS	30	60	7	14
Instrumental vaginal delivery	8	16	5	10
Total	38	76	12	24
Chi-square = 2.0114 p-value = 0.1562				

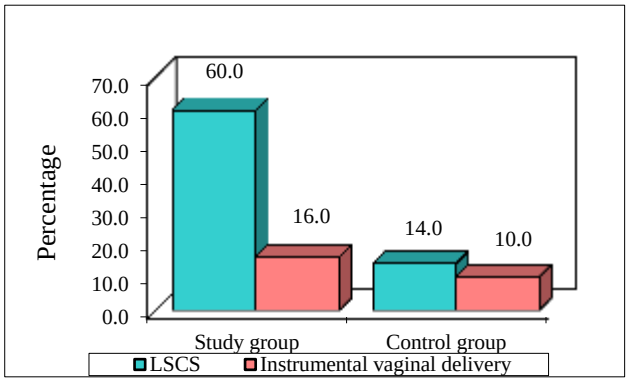

Figure 6: Interventions for fetal distress in study and control groups.

The determination of AFI ≤5 cm as a screening test in predicting fetal distress requiring LSCS has 81% sensitivity, 68% specificity, 60% positive predictive value and 86% negative predictive value. A better sensitivity and negative predictive value makes it a good screening test.

In 26 women with reactive NST in study group, 4 had spontaneous vaginal delivery (there were 3 instrumental vaginal deliveries) and 22 were induced. Of 22 induced women, 14 delivered vaginally (there were 6 instrumental vaginal deliveries) and 08 underwent LSCS as shown in Table 12.

Table 12: Different outcomes in women with reactive NST in both groups.

Different outcomes	Study group	Control group
Spontaneous vaginal delivery (including instrumental)	04	31
Induced and delivered vaginally (including instrumental)	14	08
Induced and underwent LSCS	08	03

In 24 women with non-reactive NST in study group, 2 had spontaneous vaginal delivery and 22 underwent LSCS as shown in Table 13.

Table 13: Different outcomes in women with non-reactive NST in both groups.

Different outcomes	Study group	Control group
Spontaneous vaginal delivery (including instrumental)	02	04
LSCS	22	04

Table 14: Apgar score <7 in study and control groups.

Apgar score	Study group	%	Control group	%
1 minute	27	54.00	10	20.00
5 minutes	5	10.00	1	2.00
Chi-square = 0.2918 p-value = 0.5909				

In study group, Apgar score was <7 at 1 minute in 27 (54%) neonates and at 5 minutes in 5 (10%) neonates. But in control group, Apgar score was <7 at 1 minute in 10 (20%) neonates and at 5 minutes in 1 (2%) neonate even though it was not significant statistically as shown in Table 14. The mean Apgar score in study group was 6.4 at 1 minute and 7.68 at 5 minutes. The mean Apgar score in control group was 7.06 at 1 minute and 8.34 at 5 minutes.

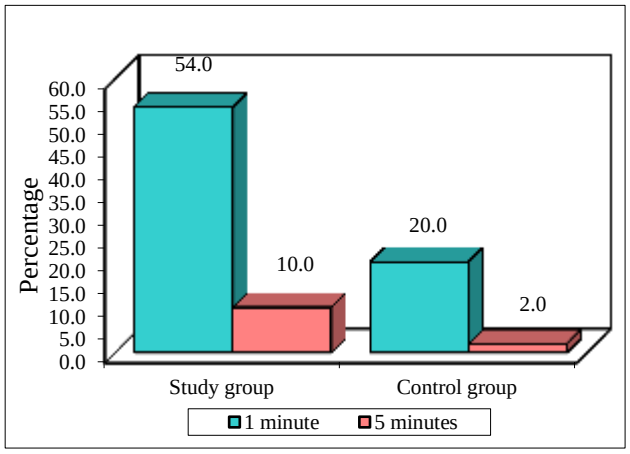

Figure 7: Apgar score <7 in study and control groups.

The birth of the babies with <2.5 kg birth weight was seen in 29 (58%) women in study group and 10 (20%) women in control group as shown in Table 15. The mean birth weight of babies in study group was 2.34 kg and 2.86 kg in control group.

In study group, 30 (60%) neonates were admitted to NICU for various reasons like birth asphyxia, meconium aspiration, and low birth weight. Only 12 (24%) neonates were admitted to NICU, in control group as shown in Table 16. The difference was significant statistically between two groups.

Table 15: Birth weights in study and control groups.

Birth weights (in kg)	Study group	%	Control group	%
≤1.5	8	16.00	0	0.00
1.6-2.0	8	16.00	1	2.00
2.1-2.5	13	26.00	9	18.00
2.6-3.0	14	28.00	24	48.00
3.1-3.5	7	14.00	15	30.00
>3.5	0	0.00	1	2.00
Chi-square = 20.1166 p-value = 0.0005*				

Table 16: NICU admission of neonates in study and control groups.

NICU admission	Study group	%	Control group	%
Yes	30	60.0	12	24.0
No	20	40.0	38	76.0
Total	50	100.0	50	100.0
Chi-square = 13.3002; p-value = 0.0001*; *p<0.05				

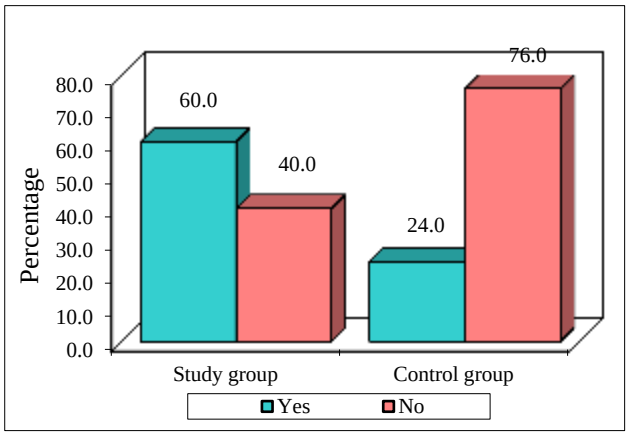

Figure 8: NICU admission of neonates in study and control groups.

There were 3 (6%) early neonatal deaths in study group and 1 (2%) early neonatal death in control group as shown in Table 17.

Table 17: Early neonatal deaths in study and control groups.

Neonatal deaths	Study group	%	Control group	%
Yes	3	6.0	1	2.0
No	47	94.0	49	98.0
Total	50	100.0	50	100.0
Chi-square = 0.2604 p-value = 0.6103				

Umbilical artery Doppler was done for all women with oligohydramnios. It was normal in 28 (56%) women. Increased resistance flow, absent diastolic flow and reversal of diastolic flow in umbilical artery Doppler was

seen in 5 (10%), 15 (30%) and 2 (4%) women respectively as shown in Table 18.

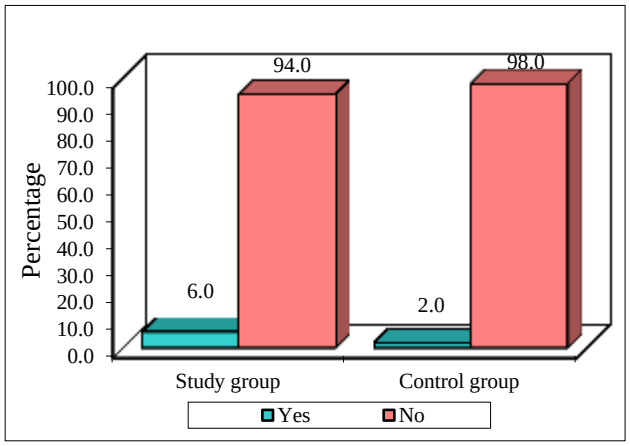

Figure 9: Early neonatal deaths in study and control groups.

Table 18: UAD of pregnant women with AFI < 5 cm (study group).

UAD	No of cases	% of cases
Normal	28	56.00
Increased resistance flow	5	10.00
Absent diastolic flow	15	30.00
Reversal of diastolic flow	2	4.00

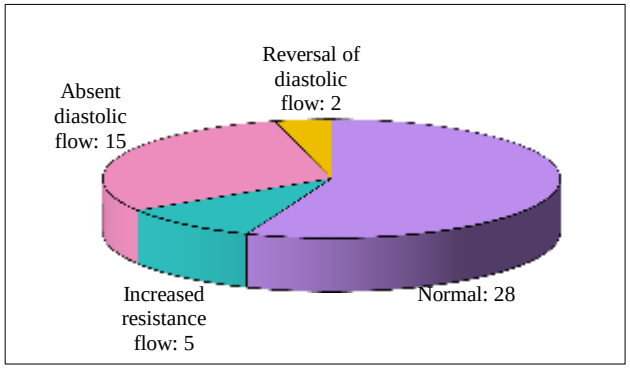

Figure 10: UAD of pregnant women with AFI =/< 5 cm (study group, n = 50).

DISCUSSION

Various variables and outcome results of our study are comparable to the results of similar studies done both in India and abroad.

Mean maternal age (in years) of study group in present study was 24.36 compared to 27.04, 22.88 and 23.9 in study by Bhagat M and Chawla I, Bangal VB et al and Casey BM et al respectively.[4] In a study by Jandial C et al, 48% women belonged to 21-25 years of age group.[5] Mean maternal age (in years) in a study by Melamed N et al, was 28.2 in active delivery group and 28.1 in expectant management group.[6]

In our study group primigravida accounted for 58% compared to 60% in the study by Jandial C et al.

In our study group 72% women were nullipara compared to 68%, 40% and 60.3 % in study by Bhagat M and Chawla I, Casey BM et al and Melamed N et al respectively. In our control group 68% women were nullipara compared to 58.9%, 37% and 57.4% in study by Bhagat M and Chawla I, Casey BM et al and Melamed N et al respectively. In present study mean gestational age at delivery was 38.06±1.73 weeks compared to 38±2 weeks in study by Casey BM et al. In study by Bhagat M and Chawla I, 56% of women were <37 weeks of gestational age at delivery. In study by Melamed N et al, gestational age at delivery was 36.7±1.1 weeks in active delivery group and 38.9±1.7 weeks in expectant management group.

Hypertensive disorders which cause chronic placental insufficiency lead to oligohydramnios. In our study group 16% women had only pre-eclampsia compared to 16 %, 12% and 4.6% in study by Bangal VB et al, Casey BM et al, Melamed N et al respectively.[7] Post-dated pregnancy only was seen in 18% of women in study group in present study compared to 16% in study by Bangal VB et al. Amniotic fluid volume is known to be reduced with advancing gestational age after 40 weeks.

NST was non-reactive in 48% women of our study group compared to 32% and 38% in a study by Bhagat M and Chawla I and Jandial C et al respectively. Occurrence of meconium stained amniotic fluid was high in women with AFI ≤5cm. Amniotic fluid was meconium stained in 44% of our study group compared to 16%, 48%, 6% and 6.7% in study by Bhagat M and Chawla I, Jandial C et al, Casey BM et al and Melamed N et al respectively.

In present study group, 44% of women were induced (induction of labour) compared to 72%, 58% and 42% in study by Bhagat M and Chawla I, Jandial C et al and Casey BM et al respectively. Caesarean delivery (LSCS) for fetal distress was done in 60% women of our study group compared to 57.1 %, 42% and 5% in study by Bhagat M and Chawla I, Jandial C et al and Casey BM et al. respectively. In study by Melamed N et al, 59% women in active delivery group and 16.7% in expectant management group underwent caesarean delivery for fetal distress.

Apgar score was <7 at 1 minute in 54% neonates in present study group compared to 36% and 10% in study by Bhagat M and Chawla I and Bangal VB et al respectively. Apgar score was <7 at 5 minutes in 10% neonates in present study group compared to 4%, 16% and 12% in study by Bhagat M and Chawla I, Bangal VB et al and Jandial C et al respectively. In present study group 58% neonates birth weight was less than 2.5 kg,

compared to 56%, 58% and 35% in study by Bhagat M and Chawla I, Jandial C et al and Casey BM et al. Birth weight of neonates in oligohydramnios group was less, due to chronic uteroplacental insufficiency. In present study group 60% of neonates were admitted to NICU compared to 92%, 16% and 7% in study by Bhagat M and Chawla I, Jandial C et al and Casey BM et al respectively.[8] In a study by Melamed N et al, 12.8% neonates in active delivery group and 6.6% in expectant management group were admitted to NICU.

Early neonatal deaths accounted for 6% in present study group compared to 16%, 6% and 5% in study by Bangal VB et al, Jandial C et al and Casey BM et al respectively.

Thus oligohydramnios causes increased occurrence of non-reactive NST, meconium stained liquor, induction of labour, development of fetal distress, rate of LSCS, low Apgar score, low birth weight neonates, NICU admissions and early neonatal deaths.

Limitations of our study are as follows:

- Only 50 cases were included in the study.
- The diagnosis of fetal distress was made depending on the NST. However the fetal acidosis was not proved by fetal scalp blood sampling or other methods.
- Neonatal follow up after 7 days was not done.

CONCLUSION

Oligohydramnios is one of the important signs of placental insufficiency, which affects the perinatal outcome.

Oligohydramnios causes increased occurrence of non-reactive NST, meconium stained liquor, induction of labour, development of fetal distress, rate of LSCS, low Apgar score, low birth weight neonates, NICU admissions and early neonatal deaths.

Amniotic fluid index determination is a valuable parameter, which can be used as an adjunct to other fetal surveillance methods. Its help to identify those neonates at risk of poor perinatal outcome.

Identification of oligohydramnios and performing fetal surveillance tests will help us to manage the patients in a better way and will definitely improve the clinical outcome.

The determination of AFI $\leq$5 cm as a screening test in predicting fetal distress requiring LSCS has 81% sensitivity, 68% specificity, 60% positive predictive value and 86% negative predictive value. A better sensitivity and negative predictive value makes it a good screening test.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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