International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Narbhavi DT et al. Int J Reprod Contracept Obstet Gynecol. 2020 Jan;9(1):305-312
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20196039

Original Research Article

Prophylactic amnioinfusion in oligohydramnios

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Received: 05 November 2019
Accepted: 06 December 2019

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ABSTRACT

Background: Oligohydramnios causes many intrapartum maternal and fetal complications. Intrapartum amnioinfusion effectively increases amniotic fluid volume and thereby decreases FH decelerations. The objective of this study was to compare the frequency of fetal heart decelerations and its perinatal outcome with and without amnioinfusion in patients with oligohydramnios and the cesarean rates for fetal distress between them.
Methods: In study group, 100 patients in labour with AFI < 5 cm, oligohydramnios and IUGR with normal doppler, postdated pregnancies with AFI ≤ 5 cm with normal doppler were selected and prophylactic amnioinfusion with 300 ml lukewarm saline is given aseptically for 15 minutes after amniotomy. Continuous CTG monitoring done till delivery. If FH decelerations occur, the bolus was repeated up to 3 times. 100 age matched controls managed with conventional methods without amnioinfusion were selected retrospectively from labour room case records.
Results: Incidence of FH decelerations was lower in study group (59% versus 84%). Cesarean section for fetal distress was reduced (20.9% versus 79.1%) Perinatal outcome was better. Babies with normal 1-minute Apgar was 86% compared to 75% in controls. Frequency of FH decelerations was reduced (20% versus 73%). Occurrence of 2 FH decelerations were 13% versus 33%, 3 FH decelerations were 7% versus 27% and > 3 times was 0% versus 13%.
Conclusions: Prophylactic amnioinfusion can easily and effectively reduce the FH decelerations and caesarean section rate for fetal distress in oligohydramnios improving both maternal and fetal outcomes with negligible risks.

Keywords: Amnioinfusion, Caesarean rate, Fetal heart decelerations, Oligohydramnios, Perinatal outcome

INTRODUCTION

Oligohydramnios occurs in about 1-5% of pregnancies at term.[1] In pregnancies of more than 40 weeks of gestation, the incidence may be more than 12% as the amniotic fluid volume declines progressively after 41 weeks of gestation.[2] Sonographically, it is diagnosed when AFI < 5 cm or single deepest vertical pocket of < 2 cm. Clinically it is diagnosed by subjective assessment of decreased amniotic fluid volume.

Women with oligohydramnios are more likely to have abnormal or non-reactive FHR tracings, increased incidence of fetal distress, meconium stained liquor and thus an increased incidence of caesarean sections by Voxman EG et al.[3] Oligohydramnios, being a leading indication for labour induction, increases cesarean delivery, particularly for primiparous women with unripe cervix by Leeman L et al.[4] AFI-assessed antepartum or intrapartum would help to identify women who need increased antepartum surveillance for pregnancy complications.[5] These patients require continuous CTG monitoring during labour.

Amnioinfusion is one of the management techniques of oligohydramnios during intrapartum period. When lack of amniotic fluid is the problem, the infusion of fluid into the amniotic cavity is a simple and logical treatment

approach. The two most common applications are treatment of severe variable decelerations in fetal heart rate and dilution of thick meconium fluid during labour.

Artificially increasing amniotic fluid volume may better protect the umbilical cord from compression, and thus reduces the number and severity of variable decelerations. Diluting thick meconium fluid reduces the risk of meconium aspiration syndrome. Prophylactic amnioinfusion may allow spontaneous vaginal delivery and avoid unnecessary operative intervention. This inexpensive technique appears to pose little risk and warrants consideration in properly selected patients thereby positively influence both maternal and neonatal morbidity and mortality rates which are considered important yardsticks of health care services in India.

METHODS

It is a hospital based comparative study conducted in the labour room of department of obstetrics and gynaecology, MCH, Kottayam from 1st October 2016 to 30th September 2017 after the approval from the institutional review board. 100 patients were selected by convenient sampling technique and were given prophylactic amnioinfusion and assigned to study group.

Proper informed consent was obtained from all patients. 100 age match controls were selected retrospectively from labour room case records who did not have amnioinfusion, but were managed with routine conventional methods like adequate maternal hydration, left lateral position, maternal oxygenation was assigned to control group.

Inclusion criteria

- Isolated oligohydramnios
- Oligohydramnios and IUGR with normal doppler
- Post-dated pregnancy with AFI ≤ 5 cm with normal doppler.

Exclusion criteria

- Fetal malpresentations
- Placenta previa
- IUGR with abnormal doppler
- Previous caesarean delivery
- PPROM resulting in oligohydramnios.

During study period 100 subjects admitted in labour room satisfying inclusion and exclusion criteria were selected. Admission NST was taken to study about the normal baseline FHR, variability and reactivity. BPP, location of placenta, IUGR, doppler values were noted. They were induced depending upon their modified Bishop's score at 37 weeks. They were observed with continuous CTG monitoring and partogram. Once they entered into active phase of first stage of labour amniotomy was done, colour and the amount of liquor was noted followed by prophylactic amnioinfusion with 300 ml of lukewarm saline bolus, which was instilled in 15 minutes using 16FG ryles tube under strict aseptic precautions. Prophylactic antibiotics were administered intravenously (triple regimen ampicillin 500 mg every 6 hours, metronidazole 500 mg every 8 hours, gentamycin 80 mg every 12 hours). Those with spontaneous onset of labour, amniotomy done at active phase of labour followed by prophylactic amnioinfusion and those with pre labour rupture of membranes were given prophylactic amnioinfusion in the beginning of labour after assessing the AFI by USG. During labour, maternal hydration and left lateral position were maintained. If they develop fetal heart decelerations, the saline boluses were repeated up to 3 times till delivery apart from prophylactic amnioinfusion. In cases of pathological CTG and need for urgent intervention they were intervened immediately by caesarean section. All of them were followed up till delivery to obtain maternal and perinatal outcomes.

Statistical analysis

Data were coded and entered in Microsoft excel and further statistical analysis was done using SPSS V 16.0 software. Method used was Pearson's Chi-square test and significant P-value was < 0.05.

RESULTS

Principle outcomes

In study group, 20.9% of patients underwent CS for fetal distress which was much lower compared to 79.1% of patients in control. Other causes of CS were abruption (2), arrest of descent (1), protracted active phase (1) and failed induction (1) in study group and failed induction (1), arrest of dilatation (1), protracted active phase (1) in controls (Table 1).

Table 1: Cesarean indication.

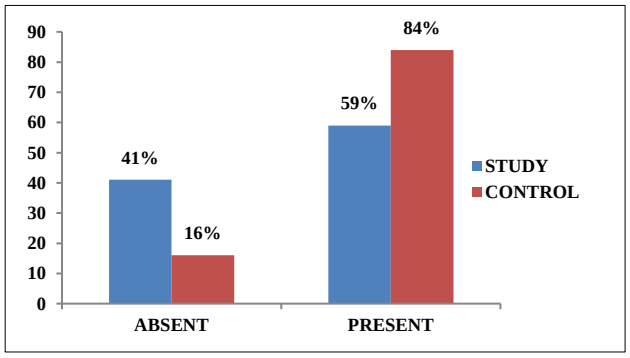
CS indication	Study group	Control group	Total
Other causes	5 (62.5%)	3 (37.5%)	8 (100%)
Fetal distress	9 (20.9%)	34 (79.1%)	43 (100%)
Total	**14 (27.5%)**	**37 (72.5%)**	**51 (100%)**

*Pearson's Chi Square value -5.853: P- value- 0.028 (significant); CS-cesarean section.

The incidence of FH deceleration was significantly lower, which was 59% compared to 84% in control group (Figure 1).

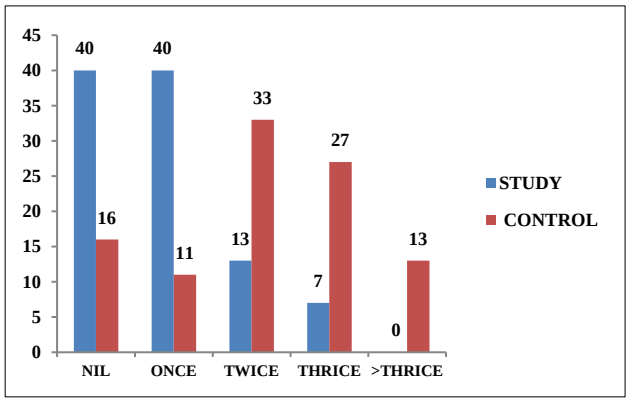
The frequency of FH decelerations was significantly reduced among study group. The patients with 2 or more FH decelerations were comparatively much lower than control group. Only 20 patients had 2 or more decelerations compared to 73 among controls. Among 20, 13 had 2 FH decelerations and 7 had 3 decelerations. Among 73, 33 had 2 FH decelerations 27 had 3 and 13

had > 3 FH decelerations. In study group none developed > 3 FH decelerations (Figure 2).



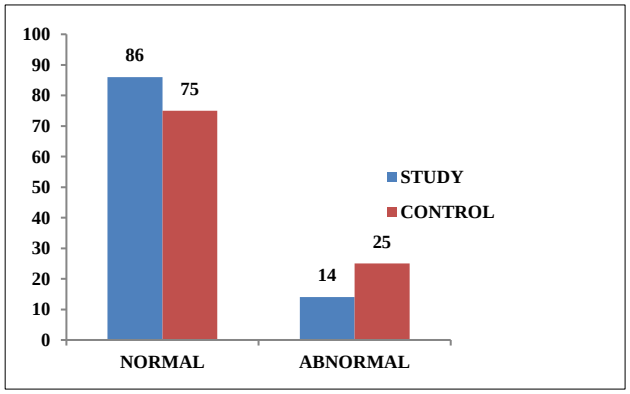
*Pearson Chi-Square value-15.336; P < 0.001 (significant).

Figure 1: Incidence of FH decelerations.



*Pearson Chi-Square value-60.236; P-value-< 0.001 (significant).

Figure 2: Frequency of FH decelerations.

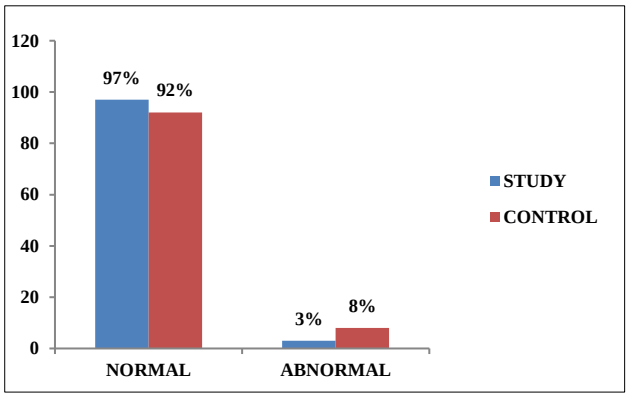


*Pearson Chi-Square value - 3.854; P-value - 0.037 (significant).

Figure 3: 1-minute Apgar.

In study group, 86 babies had normal 1-minute Apgar compared to 75 babies in control. This showed significant improvement in neonatal outcome with prophylactic amnioinfusion (Figure 3 and 4).

Patients in amnioinfusion group also had reduced instrumental deliveries of 17% for fetal distress when compared to 25% in control group and increased normal vaginal delivery rate of 69% compared to 38% in controls. Indication of 17 instrumental deliveries, were fetal distress (8) and failure of secondary powers (9). Indication of 25 instrumental deliveries among controls includes fetal distress (15) and failure of secondary powers (10) (Table 2).



*Pearson Chi-Square value-2.405; P-value-0.107 (insignificant).

Figure 4: 5-minute Apgar.

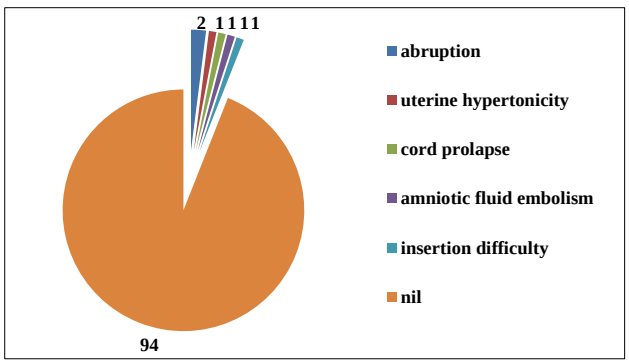
Table 2: Mode of delivery.

Mode of delivery	Study group	Control group	Total
Normal labour	69 (69%)	38 (38%)	107 (53.5%)
Instrumental	17 (17%)	25 (25%)	42 (21%)
Cesarean section	14 (14%)	37 (37%)	51 (25.5%)
Total	**100 (100%)**	**100 (100%)**	**200 (100%)**

*Pearson chi-square value-20.878; P-value <0.001 (significant).

Maternal outcomes

The maternal complications following amnioinfusion includes abruption (2), uterine hypertonicity (1), cord prolapse (1), amniotic fluid embolism (1) and difficulty in ryles tube insertion (1) which were statistically insignificant (Figure 5).



*Pearson Chi-Square value-2.000; P-value- < 0.001 (significant).

Figure 5: Maternal complications.

In amnioinfusion group 6 patients had maternal pyrexia, 11 patients had PPH and 2 patients had puerperal sepsis. While 4 had pyrexia and 8 had PPH in control group. This shows there was no significant increase in maternal risks following procedure (Table 3).

Table 3: Maternal outcomes.

Outcomes	Maternal pyrexia		Postpartum hemorrhage		Puerperal sepsis	
	Absent	Present	Absent	Present	Absent	Present
Study	94	6	89	11	98	2
Control	96	4	92	8	100	0
*P-value	0.374		0.315		0.249	

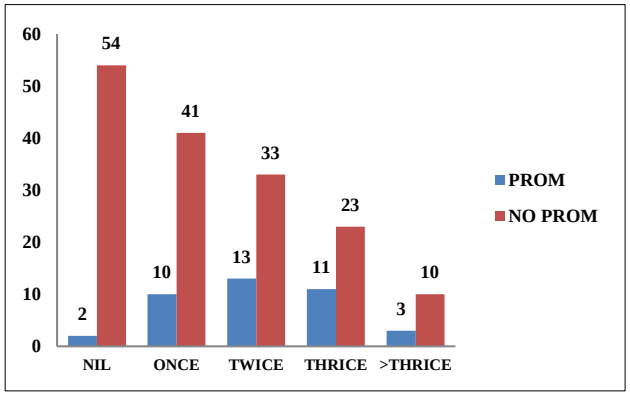
*P-values -insignificant.

Table 4: Duration of first and second stages of labour.

Duration of labour	First stage		Second stage	
	Study	Control	Study	Control
Normal	85	76	81	84
Prolonged	15	24	19	16
Total	100	100	100	100
Pearson's chi square value	2.580		0.312	
*P-value	0.076		0.355	

*P-values -insignificant.

We did not find any significant difference in duration of first and second stages of labour among study and control group. 15 and 19 patients had prolonged first stage and second stage of labour respectively compared to 24 and 16 patients in control group (Table 4).

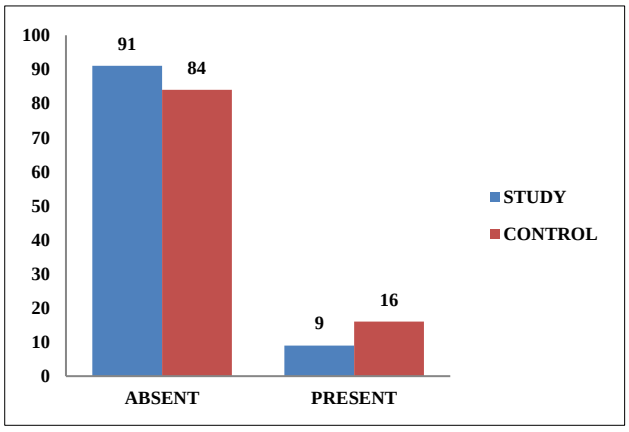


*Pearson Chi-Square-14.985 P-value- .005 (significant).

Figure 6: PROM and its influence on FH deceleration.

Patients with PROM were more prone for prolonged and severe FH decelerations. 7.7% of patients with PROM had FH decelerations more than thrice compared to 6.2% without PROM and also 33.5% with PROM and 5.1% among patients without PROM did not develop FH decelerations (Figure 6).

The incidence of meconium was 9% among study group compared to 16% in controls while meconium aspiration syndrome was 4% versus 15%. This showed significant reduction in meconium aspiration syndrome among study group (Figure 7).

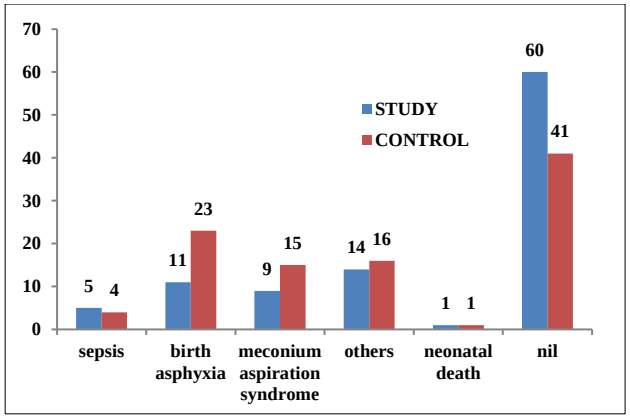


*Pearson's Chi-Square -2.240; P-value-0.099 (insignificant).

Figure 7: Meconium.

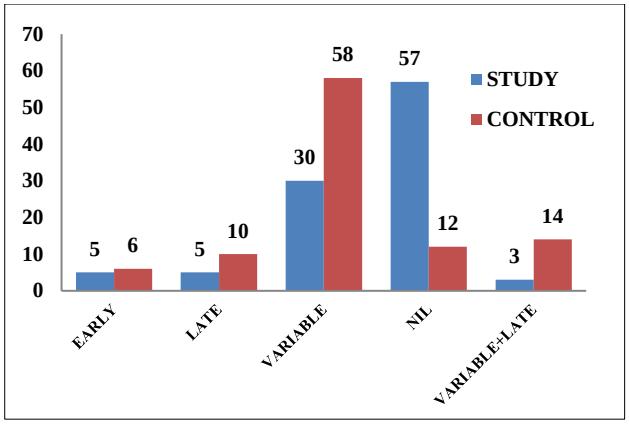
Neonatal outcomes

There was no significant increase in risk following procedure. 1 neonatal death in study group occurred due to cord prolapse and 1 in control group was due to congenital anomaly. Other causes of NICU admissions unrelated to amnioinfusion were like hyperbilirubinemia, anomalies work up, hypoglycaemia and low birth weight etc (Figure 8).



*Pearson Chi-Square -5.0497; P-value-0.2822 (insignificant).

Figure 8: Neonatal intensive care unit admissions.



*Pearson Chi-Square-47.132; P-value-< 0.001 (significant).

Figure 9: Type of deceleration.

Other outcomes

A total 58 patients in control group had variable decelerations compared to only 30 patients in study group. 10 in controls compared to 5 in study had late decelerations. This shows, variable and late decelerations were reduced significantly with amnioinfusion (Figure 9).

Patients with early decelerations had more normal labour compared to other types. Patients with both variable and late decelerations had more CS (88%). Causes of CS without any decelerations includes abruption (2), failed inductions (2), protracted active phase (2), arrest of descent (1), arrest of dilatation (1) and cord prolapse (1) (Table 5).

Table 5: Type of decelerations versus mode of delivery.

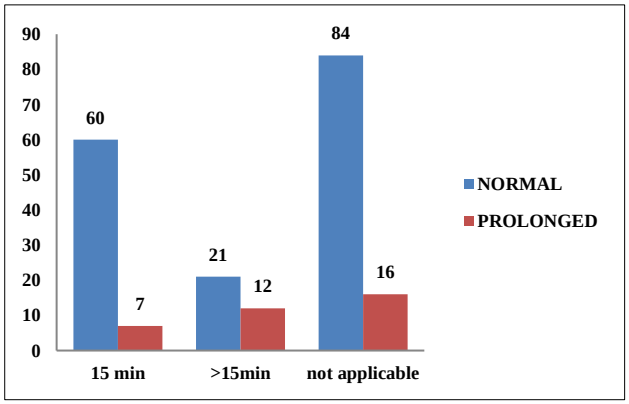
Type of decelerations	Mode of delivery			Total
	Normal labour	Instrumental	CS	
Early	6 (54.5%)	3 (27.3%)	2 (18.2%)	11 (100%)
Late	8 (53.3%)	2(13.3%)	5 (33.3%)	15 (100%)
Variable	44 (50%)	24(27.3%)	20 (22%)%)	88 (100%)
Nil	47 (68.1%)	13(18.8%)	9 (13%)	69 (100%)
Variable + late	2 (11.8%)	0	15 (88%)	17 (100%)
Total	**107 (53.5%)**	**42 (21.0%)**	**51 (25%)**	**200 (100%)**

*Pearson Chi-Square -45.786; P-value- < 0.001 (significant).

Patients with lesser need for additional amnioinfusion had more chance of normal labour.34 patients with no additional amnioinfusion had normal labour while no patients with 3 additional infusions had normal labour. Likewise, 100% of patients with 3 additional amnioinfusion had CS while only 7% with no additional infusions had CS. The 3 cases who underwent CS following only prophylactic amnioinfusion were for 2 cases of abruption and 1 case of cord proloapse (Table 6).

A total of 10.4% of patients with only prophylactic amnioinfusion and 36.4% of those who received additional amnioinfusion had prolonged second stage (Figure 10).

More number of babies had abnormal Apgar scores in patients with more frequent FH decelerations. 7.7% with one FH deceleration compared to 28.2% with > 3 decelerations had abnormal Apgar. 2 babies with multiple congenital anomalies had abnormal Apgar without any decelerations (Table 7).



*Pearson Chi-Square-10.597 P-value- 0.005 (significant).

Figure 10: Duration of amnionfusion versus duration of second stage of labour.

Table 6: Additional amnioinfusion versus mode of delivery.

MOD / Add amnio	Normal labour	Instrumental delivery	CS	Total
Nil	34 (79.1)	6 (14%)	3 (7%)	43 (100%)
Once	28 (75.7%)	6 (16.2%)	3 (8.1%)	37 (100%)
Twice	7 (53.8%)	5 (38.5%)	1 (7.7%)	13 (100%)
Thrice	0	0	7 (100%)	7 (100%)
Not applicable	38 (38%)	25 (25%)	37 (37%)	100 (100%)
Total	**107 (53.5%)**	**42 (21%)**	**51 (25.5%)**	**200 (100%)**

*Pearson Chi-Square -54.645; P-value -< 0.001 (significant) (Add amnio-additional amnioinfusion; MOD-mode of delivery).

Table 7: Number of FH decelerations and 1-minute Apgar.

Number of FH decelerations	1-minute APGAR		Total
	Normal	Abnormal	
Nil	54 (33.5%)	2 (5.1%)	56 (28%)
Once	48 (29.8%)	3 (7.7%)	51 (25.5%)
Twice	40 (24.8%)	6 (15.4%)	46 (23%)
Thrice	17 (10.6%)	17 (43.6%)	34 (17%)
>Thrice	2 (1.2%)	11 (28.2%)	13 (6.5%)
Total	**161 (100%)**	**39 (100%)**	**200**

*Pearson Chi-Square-71.560; P-value-< 0.001 (significant).

DISCUSSION

The incidence of oligohydramnios in our hospital was found to be 2.8%. In India, the incidence ranges from 1-5%.

Maternal characteristics of the women taken for the study were evenly distributed among the amnioinfusion and the non-infusion group. In patients who received prophylactic amnioinfusion, we found no change in maternal vital signs and peripheral venous pressure. No patient discontinued study because of any adverse effects. Prophylactic amnioinfusion of 300 ml normal saline through ryles tube could reduce the FHR decelerations in oligohydramnios thereby reducing CS rate for fetal distress.

The results of CS rate (20.9% versus 79.1%, P-0.028), reduction of FH decelerations (59% versus 84% P < 0.001) were consistent with results of studies conducted by Miyazaki FS et al.[6] (14.8% versus 47.6%; 4.2% versus 51%), Schrimmer DB et al.[7] (P-0.0001; P-0.0001) Strong TH et al (P-0.002; P-0.04).[8] Owen J et al (4.7% versus 16%), Perrson et al (13% versus 29%).[9,10]

This study result is also comparable with studies by Nageotte MP et al, and Regi A et al, which also showed prophylactic amnioinfusion was successful in decreasing CS rate due to fetal distress and also in reducing FH decelerations.[11,12]

This study shows significant reduction in variable and late decelerations with amnioinfusion. These results were similar to a prospective study by Micheal P et al who also concluded that there was significant decrease in both frequency, severity and average number of variable decelerations in first and second stages compared with controls.[13]

Patients who had both variable and late decelerations had high incidence of caesareans compared to other type of FH decelerations. They were not benefitted by amnioinfusion which may be attributed to nature of decelerations like severity and duration of variable and late decelerations and their recurrences.

The maternal complications due to amnioinfusion in the study group were insignificant compared to control group.1 patient had difficulty in ryles tube insertion since she reported to labour room with fully dilated cervix with fetal head at +1 station.

The patient who developed amniotic fluid embolism was a grand multipara who was induced with oral PGE1 50 microgram 3 doses. She also developed hyperstimulation in the active phase. So, the cause of amniotic fluid embolism may not be due to the procedure per se since she had multiple other predisposing factors for the event. In this study, contractions that last longer than 60 seconds are considered as hypertonus, and more than 5 contractions in 10 minutes as tachysystole.

We did not find any significant difference in duration of first and second stages of labour among study and control group. In this study, duration of first stage of labour was considered prolonged if first labours last over 18 hours

and second and subsequent labours last over 12 hours. Duration of second stage was considered prolonged if it lasted more than 2 hours in nulliparous and 1 hour in multiparous women.

This result was comparable with a meta-analysis conducted by Strong TH Jr which also revealed amnioinfusion has no effect on the duration of labor.[14]

Among the study group, when the duration of amnioinfusion increased by multiple additional amnioinfusions we observed proportional increase in duration of second stage of labour. We also observed proportionate increase in CS rate among patients who received multiple amnioinfusions in study group.

That may be attributed to technical difficulties in amnioinfusion especially in case of well dilated cervix, small fetal head of IUGR babies where fetal head may not be well applied to cervix which may lead to leakage of normal saline after infusions leading to poor retention of fluid within uterine cavity. Reduced intrapartum AFI leads to dry labour contributing to improper mechanism of labour and further FH decelerations with prolonged second stage of labour thereby leading to CS for fetal distress and also other causes.

These results were consistent with study conducted by Micheal P et al which also showed increase in mean length of second stage of labour in study group although total length of labour remained the same.[13] The significance of intrapartum AFI was suggested by a study of Strong TH et al who showed significantly lower rates of meconium passage, severe variable decelerations end-stage bradycardia when intrapartum AFI ≥ 8.0 cm throughout labour maintained.[8]

In this study we have adopted intermittent amnioinfusion technique which is equally good compared to continuous infusion techniques using pumps and warmers. In a randomized controlled trial by Rinehart BK et al suggested that intermittent bolus amnioinfusion is as effective as continuous infusion in relieving variable decelerations in labour.[15] A study conducted by Glantz JC, Letteney DL concluded that there is no demonstrable benefit using infusion pumps or solution warmers during amnioinfusion.[16]

Patients with PROM were more prone for prolonged and severe FH decelerations. This result was also similar to study conducted by Micheal P et al which also showed PROM and chronic uteroplacental insufficiency have a higher risk for severe and prolonged variable decelerations.[13]

This study showed significant reduction in meconium aspiration syndrome among study group. This result was consistent with study by De Meeus JB et al which found less intervention for fetal distress and less neonates with meconium below the vocal cords in the infused group.[17]

Abnormal 1- and 5-minute Apgar score (score < 7) were related to frequency of FH decelerations. More number of babies had abnormal APGAR scores in patients with more frequent FH decelerations. This may be due to fetal hypoxia. So, patients who required additional amnioinfusion's due to recurrent decelerations had more chance of poor neonatal outcome.

Even though, therapeutic additional amnioinfusion's were successful in preventing further FH decelerations in patients with 1 or 2 FH deceleration, they failed to prevent worsening in patients with 3 or more decelerations which may be either due to chronic hypoxic fetus producing recurrent, severe variable decelerations or due to poor retention of fluid and so less intrapartum AFI.

CONCLUSION

This technique provides the lacking fluid compartment and aids in progression of labour by maintaining the normal mechanism of labour without much changes in the duration of labour.

This intermittent infusion technique also succeeded as a therapeutic technique in case of recurrent variable decelerations in majority of cases by preventing fetal distress except in few chronic uteroplacental insufficient cases which were non-responders due to chronic growth restriction and chronic hypoxia or inadequate intrapartum AFI.

This study were also able to reduce meconium aspiration syndrome by diluting the thick meconium and also preventing FH decelerations due to meconium stained liquor and its adverse effects.

This study were also able to improve neonatal outcome by improving 1 min Apgar scores and NICU admission.

The maternal complications of amnioinfusion like maternal pyrexia, PPH, puerperal sepsis was less significant.

Prophylactic amnioinfusion had lesser CS rate when compared to therapeutic amnioinfusion. CS rate proportionately increased with number of amnioinfusions.

This isotonic fluid also maintains the acid-base balance in the fetal environment thereby preventing fetal acidosis resulting in FH decelerations and vice versa

The intermittent infusion technique was adopted since it reduces infection rate without altering the efficacy of the technique, which is also convenient for the patient.

This study concludes that prophylactic amnioinfusion is one of the cheapest technique which can be used to reduce the caesarean section rate for fetal distress and incidence and frequency of FH decelerations in

oligohydramnios significantly by utilising readily available materials in a labour room, thereby improving both maternal and fetal outcomes with negligible risks. This can be conveniently used in all labour room settings from primary health centre to tertiary set up without much difference in the routine intrapartum management but with significant successful outcomes.

ACKNOWLEDGMENTS

Authors would like to thank to Dr. Cicily T. J., the Head of the department of obstetrics and gynecology, Government Medical College, Kottayam for her valuable suggestions and expert guidance. Authors also thank Dr. Austoria Arun, department of community medicine for her help in statistical analysis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Narbhavi DT, Cicily TJ, Kala BS. Prophylactic amnioinfusion in oligohydramnios. Int J Reprod Contracept Obstet Gynecol 2020;9:305-12.