

Prospective Clinical Study of Pregnancy Outcome in Amniotic Fluid Index Less Than Five in Term Low Risk Pregnancy

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A B S T R A C T

Introduction: The ultimate goal of antepartum surveillance program is to improve perinatal outcome and to decrease intrauterine fetal demise besides prevention of maternal morbidity and mortality. Normal amniotic fluid index is one of the indicators of foetal well-being. Oligohydramnios is defined as amniotic fluid index (AFI) of less or equal to five centimetres. This study was conducted to determine whether an antepartum amniotic fluid index (AFI) of 5 cm or less can be used as an adjunct to other fetal surveillance methods as a predictor of adverse pregnancy as compared with outcome in those with normal AFI.

Material and methods: This was a Cohort study done from over a period of 12 months (August 2016 to July 2017) at Civil Hospital, Aizawl. Patients were selected from those who fulfilled these inclusion and exclusion criteria. It consists of analysis of pregnancy outcome in 50 cases with diagnosis of oligohydramnios by ultrasound after 37 completed weeks of gestation (Cohort 1) compared with 50 controls with no oligohydramnios (Cohort 2) and matched for other variables like age, parity, gestational age. Various outcomes results were recorded and tabulated. The results were statistically analysed using parameters like mean, standard deviation and chi square test. In addition, epidemiological parameters like sensitivity, specificity, positive predictive value, negative value were used.

Result: There were significant differences between two groups in delivery by LSCS for foetal distress ($p < 0.001$) particularly among patients with AFI 0-1 ($p < 0.01$). There was increased incidence of labour induction in women with AFI ≤ 5 cms than women with AFI > 8 cms ($p < 0.01$).

Conclusion: An amniotic fluid index of ≤ 5 cms detected after 37 completed weeks of gestation is an indicator of poor pregnancy outcome. Determination of AFI can be used as an adjunct to other foetal surveillance methods. Determination of AFI is a valuable screening test for predicting foetal distress in labour requiring caesarean section.

Keywords: Oligohydramnios, Amniotic Fluid Index, Amniotic Fluid Volume, Ultrasound, Non Stress Test.

INTRODUCTION

Amniotic fluid is an important part of pregnancy which plays a vital role in the normal growth of the fetus and promotes musculo-skeletal development and allows for easier fetal movement. The abnormalities of the fluid volume can thus interfere directly with foetal development or may be an indirect sign of underlying disorder such as foetal hypoxia, neural tube defect or gastro intestinal obstruction.

The ultimate goal of antepartum surveillance program is to improve perinatal outcome and to decrease intrauterine foetal demise besides prevention of maternal morbidity and mortality.^{1,2} A foetus in distress should be identified at the earliest so that timely delivery will not only salvage the foetus but also prevent long term neurological impairments such as injury to foetal central nervous system³

With the development of ultrasound imaging, the amniotic fluid volume assessment has progressed from a stage of

subjective impression to the present state in which relatively sophisticated judgments of foetal conditions can be based on reproducible measurements by ultrasound. Assessment of amniotic volume is now routine when performing a sonographic evaluation of foetal status and in an important consideration in the assessment of perinatal morbidity and mortality.^{4,5}

The purpose of studying women with oligohydramnios at term pregnancies are because the etiology, management and the outcome is different in late onset oligohydramnios compared to early onset oligohydramnios.

Amniotic fluid index of ≤ 5 cm defines oligohydramnios as originally described by Phelan et al.⁶ Many studies show that oligohydramnios is associated with variety of ominous pregnancy outcomes, such as foetal distress, low birth weight, perinatal morbidity, perinatal mortality and increased incidence of caesarean section. However, some studies show that amniotic fluid index is a poor predictor of adverse

outcome.

Thus this study is conducted to determine whether an antepartum amniotic fluid index (AFI) of 5 cm or less can be used as an adjunct to other foetal surveillance methods as a predictor of adverse pregnancy as compared with outcome in those with normal AFI.

Study aimed to determine whether an antepartum amniotic fluid index (AFI) of 5 cm or less as a predictor of adverse pregnancy outcome in terms of onset of labour, mode of delivery, occurrence of abnormal FHR pattern / fetal distress, birth weight, APGAR score and neonatal morbidity and mortality

MATERIAL AND METHODS

This study consisted of an analysis of pregnancy outcome in 50 cases with diagnosis of oligohydramnios (AFI less than 5) by ultrasound after 37 completed weeks of gestation compared with 50 controls with no oligohydramnios (AFI more than 8) and matched for other variables like age, parity, gestational age and any pregnancy complication.

The study and control group consisted of women admitted to Civil Hospital, Aizawl. This was Cohort study done over a period of 12 months (August 2016 to July 2017). All the cases that were available up to the study period and those patients who fulfilled inclusion and exclusion criteria have been taken for the purpose of study.

For all the selected cases, 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. Ultrasound examination was done and amniotic fluid index was calculated by four quadrant amniotic fluid volume measurement technique (fig1:A, B). Oligohydramnios is defined as amniotic fluid index ≤ 5 cm. The amniotic fluid volume is considered normal if amniotic fluid index is between 5.1 and 20 cm.

Baseline investigations like haemoglobin, blood group and Rh typing, urine examination were done. NST was done for all patients.

For each case control was taken with similar gravidity, parity, gestational age but the amniotic fluid index of more than 8 cm and less than 20 cm were taken.

Inclusion criteria

1. AFI less than or equal to 5
2. Single live intrauterine gestation with only cephalic presentation free of anomaly
3. Gestational age and EDD calculated by ultrasound at 11weeks -13 weeks 6 Days gestation
4. 37 completed weeks of gestation was estimated from 1st trimester ultrasound dating
5. Intact membrane
6. Adequate pelvis

Exclusion criteria

AFI more than 5 and women with ruptured membranes, maternal infections, short stature, APH, previous LSCS, myomectomy, high risk pregnancies and those on prostaglandin synthetase inhibitors and angiotensin converting inhibitors were excluded.

Protocol for management was similar in both case group and control group. On admission, NST was done for all women in both case and control groups. If NST found reactive, then further management was done according to protocol and if non reactive, emergency LSCS was done. If patient was in labor (i.e. less than 3 cm in primigravida and less than 4 cm in multigravida were included in study), oxytocin drip was started.

Women with oligohydramnios and women in control group, if not in labour, Bishops scoring was done. Oxytocin was started if cervix was favourable. Induce with Dinoprostone gel in case of unfavourable cervix. Reassess the Bishops score after 12 hours of instillation. If in labour, start oxytocin drip. If not in labour, watch for another 12 hrs. Case was to be taken for emergency LSCS if no progress. All cases were monitored by continuous electronic foetal monitoring in labour. Any signs of foetal distress LSCS done. After 3 centimetre dilatation of the cervical os in primigravida and 4 cm dilatation in multigravida, ARM was done and was classified as clear and meconium stained liquor.

Cases with meconium stained liquor and non reactive NST were taken for emergency LSCS. All new born were attended by Paediatrician. Various outcome measures recorded were induced versus spontaneous labour, nature of amniotic fluid, FHR tracings, mode of delivery, indication for caesarean section or instrumental delivery, APGAR score at 1 minute and 5 minutes, birth weight, admission to neonatal ward, perinatal morbidity and mortality. Cases with meconium stained liquor and no reactive NST were taken for emergency LSCS

RESULT

The age distribution is shown in table 1. The maximum number of study group and control group belongs to the age group of less than 20 years. The mean age for study group was 22.054 years and that of control group was 22.24 years. There was no difference in the age distribution between two groups statistically.

The distribution of gravidity and parity are shown in table 2 and 3 respectively. The mean gravidity was 1.70 and 1.64 and mean parity was 0.5 and 0.48 respectively for cases and controls. Maximum numbers of patients were primigravidas in study group and in control groups. There exists statistical significant difference in both the groups (p-0.04). In the study group, maximum women were nulliparous. In control group, maximum women were nulliparous and para 1 women. These observations are not statistically significant (p-0.17)

The mean gestational age was 38.56 weeks for study group and 39.36 weeks for control group which was similar. In study group, 37 and 38 weeks of gestation groups constitute about 26% each. In control group, many were 40 weeks of gestation (46%). There is statistical significance between the groups (p-0.02).

The mean AFI for study group was 3.21 cm and for control group was 10.83 cm. In study group, 32% belongs have AFI between 4-5 cm where as in controls, 54% have AFI between 8-10 cm.

The outcome parameters analysed include non stress test, fetal heart rate decelerations on CTG, nature of amniotic

Age Group	Study group (n = 50)	Controls (n=50)	Total
Up to 20 years	21 (42.0%)	21 (42.0%)	42 (42%)
21-22 years	06 (12.0%)	11 (22.0%)	17 (17%)
23-24 years	06 (12.0%)	07 (14.0%)	13 (13%)
> 24 years	17 (34.0%)	11 (22.0%)	28 (28%)
Total	50 (100%)	50 (50%)	100 (100%)
Chi-square – 2.83, df (degree of freedom) – 3, p value – 0.41			

Table-1: Age-wise Distribution

AFI	Mode of delivery			Total
	FTND	FTVD	LSCS	
0-1 cm	2(22.2%)	02(22.2%)	05(55.6%)	09(100%)
1.1-2 cm	05(50%)	04(40%)	01(10%)	10(100%)
2.1-3 cm	01(16.6%)	03(50%)	02(33.4%)	06(100%)
3.1-4 cm	03(33.3%)	06(66.7%)	00(0.0%)	09(100%)
4.1-5 cm	03(18.7%)	10(62.6%)	03(18.7%)	16(100%)
Total	14(28%)	25(50%)	11(22%)	50(100%)
Row percentage*, Chi-square-10.34, df-8, p value- 0.01 (significant)				

Table-2: Relation between amniotic fluid index and mode of delivery among study group*

AFI	LSCS	Vaginal	Total
</= 5 cm	11(a)	39(b)	50
> 5 cm	02(c)	48(d)	50
Total	13	87	100
Sensitivity = a/a+c * 100 = 11/13 * 100 = 84.6% Specificity = d/b+d * 100 = 48/48 * 100 = 55%			
Positive predictive value = a/a+b*100 = 11/50*100 =22% Negative predictive value = d/c+d*100 = 48/50*100 =96%			

Table-3: Validity of AFI ≤ 5 as a screening tool for LSCS

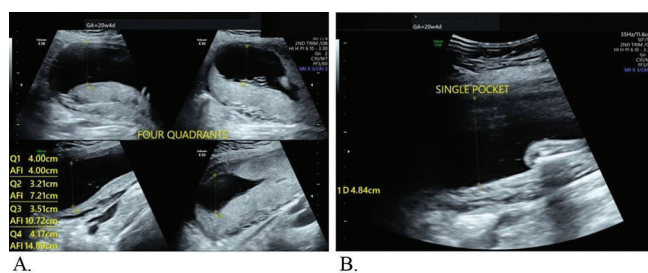
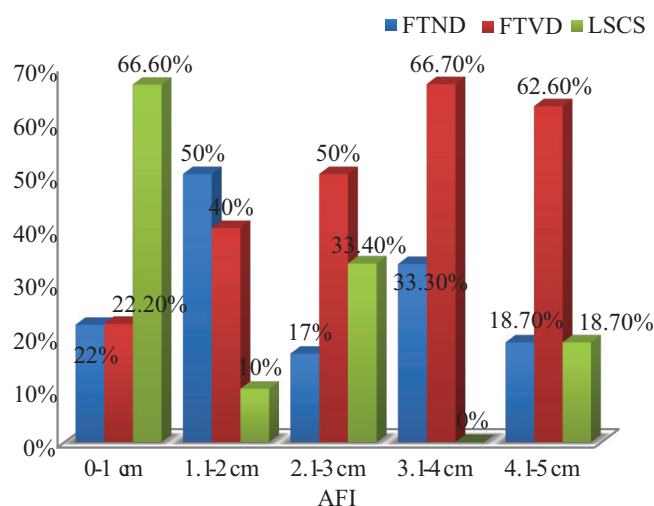


Figure-1A and B: Four quadrant and single quadrant methods of assessment of Amniotic Fluid Index (AFI) by ultrasound.

fluid, induction rate, mode of delivery, occurrence of LSCS for fetal distress, APGAR score at 1 minute and 5 minutes, birth weight, admission to neonatal ward and perinatal mortality, induction delivery interval. The NST was non reactive in 5 (10%) women with AFI ≤5 cm compared to only 1 (2%) in control group. There was no significant difference between two groups in occurrence of non reactive and reactive NST pattern (P- 0.09). Most common FHR abnormality include variable decelerations found in 2(4%) women in study group. Late decelerations in 1(2%) of women of study group. In the control group, no fetal heart rate decelerations were found.



Graph-1- Relation between Amniotic Fluid Index and mode of delivery among study group*

However, these ominous FHR were seen in those women of control group who had an AFI in the lower range. There was no significant difference in two groups in occurrence of FHR decelerations statistically (P= 0.24).

The amniotic fluid was meconium stained in 9(18%) and clear in 41(82%) women in study group. In control group, only 4(8%) women had meconium stained amniotic fluid and 46(92%) had clear amniotic fluid. The difference in occurrence of meconium stained amniotic fluid between two groups was not statistically significant.

The labour was induced in 28(56%) women with AFI ≤5 cm and 18(36%) women with AFI > 8cm. In control groups, 32(64%) delivered spontaneously. The decision for induction of labor was made depending upon gestational age and NST. Depending on CTG recording, spontaneous labor was allowed. The difference between two groups in this category was statistically significant (P-0.01).

FTND (full term normal delivery) includes all spontaneous vaginal deliveries and FTVD (full term vaginal delivery) includes all induced vaginal deliveries. Number of women delivered by LSCS was 11 (22%) among study group compared to 2 (4%) in control group. There was statistical significant difference among two groups in this category (p- 0.0001). Indication for LSCS in both groups was fetal distress

The mean birth weight was 2.64 kg in study group and 2.74 kg in control group. The difference in the mean birth weight was not statistically significant (p-0.51). Mean 1 min APGAR score was 6.8 and 6.7 in study and control groups respectively. It is not statistically significant (p-0.62). Mean 5 min APGAR score was 8.8 and 8.7 in study and control groups respectively, which is also not statistically significant (0.06).

The 5 min APGAR < 7 was seen in 4% in study group and 2% in control group. The mean APGAR score was not statistically significant and the difference in the occurrence of APGAR score <7 was statistically not significant (P=0.37) 2 neonates (4%) of study group were admitted to neonatal ward for morbidities like birth asphyxia and meconium aspiration. No one from control group was admitted to

neonatal ward. The difference in the two groups was not statistically significant ($P < 0.24$)

No neonatal death occurred in both study and control groups. Strict adherence to management protocol as mentioned before is followed i.e. NST before induction, CTG monitoring in labour, timely interventions lead to zero mortality in study as well as control groups.

In the study group, 28 patients among 50 were induced, whereas in control group, 18 among were induced. Induction-Delivery interval was less than 6 hrs in 14 (50%) in study group and 8 (44.4%) in control group. In control group, 3 (16.7%) patient delivered after 12 hrs compared to study groups 2 (7%). It was not statistically significant ($p = 0.59$).

FTND (full term normal delivery) includes all spontaneous vaginal deliveries and FTVD (full term vaginal delivery) includes all induced vaginal deliveries. Maximum number of LSCS occurred in study group with AFI less than 1 i.e. 5 (55.6%). This observation is statistically significant ($p = 0.01$). FTND in 5 (50%) cases with AFI 1.0-2 and FTVD in 10 (62%) cases with AFI 4.1-5 (graph-1).

Non reactive NST cases were taken up for LSCS in both study and control groups according to our protocol. Five women in study group and one woman in control group underwent LSCS. Among 45 women in study group who were initially had reactive NST, 6 (13.3%) were taken up for LSCS since they had meconium stained liquor as labor progressed. This observation is statistically significant ($p = 0.04$).

DISCUSSION

A cohort study conducted in Civil Hospital, Aizawl from August 2016 to July 2017, which contains analysis of Pregnancy outcome of term isolated oligohydramnios and normal term pregnancies after matching the demographic variables. The various outcome results of similar studies done both in India and abroad.

Gravidity and parity wise analysis: The mean gravidity in present study is 1.7 which is comparable to mean gravity of 2 in study by Baron et al.⁷ The mean parity is 0.5 comparable that of mean parity of 1 in Baron et al study and 0.6 in study by Magaan et al.⁸

Gestational age: The mean gestational age was 38.56 weeks for study group and 39.36 weeks for control group which was similar.

AFI: The mean AFI for study group was 3.21 cm and for control group was 10.83 cm.

Non-Reactive Non Stress Tests: The non reactive NST rates are high in women with AFI < 5 cm. The rate of non reactive NST is 4%, 69.23% and 41% in studies conducted by Kumar P et al⁹, Chandra et al¹⁰, Sriya R et al¹¹ respectively. In present study only 10% cases had non reactive NST and are less compared to that in similar study.

FHR Deceleration: The FHR decelerations, during intrapartum period suggestive of fetal distress are common in pregnant women with AFI ≤ 5 cm. Most common are variable decelerations due to cord compression. The ominous FHR pattern noted in 8% in present study is less compared to 48% and 36.11% in studies by Casey et al¹² and Sriya R et

al¹¹ respectively.

Occurrence of Meconium Stained Liquor: The occurrence of meconium stained amniotic fluid is high in women with AFI ≤ 5 cm. The meconium stained liquor was noted in 18% in study group in present study which is comparable to study conducted by Chandra P et al¹⁰ (23.7%). The studies by Rutherford et al¹³ and Sriya R et al¹¹ had meconium stained liquor about 54% and 38.88% respectively. In a study by Grubb et al¹⁴ 99% of women with AFI ≤ 5 cm and prolonged deceleration, had meconium stained liquor. According to our study protocol, meconium stained liquor cases and fetal distress were taken up for emergency LSCS.

Onset of Labour: The labour was induced in 28(56%) women with AFI < 5 cm and 18 (36%) women with AFI > 8 cm. In control groups, 32 (64%) delivered spontaneously. In study groups, 22 (44%) delivered spontaneously.

LSCS for Fetal Distress: Various studies show different rates of LSCS for fetal distress was done in 22% in present study which is compared with the situations in other studies. The LSCS rates were 76.92%, 51%, 43.93% respectively with study conducted by Chandra P et al¹⁰, Casey et al¹², Sriya P et al.¹¹ Oligohydramnios (AFI ≤ 5 cm) has been used as a screening test for the development of fetal distress, subsequently during intrapartum period Including only isolated oligohydramnios cases in our study may be the cause for decrease in LSCS rates for foetal distress.

Parameters	Baron et al 1995 ⁷	Chandra P et al 2000 ¹⁰	Present study
Sensitivity	78%	76.92%	84.6%
Specificity	74%	73%	55%
Positive Predictive Value	33%	50%	22%
Negative Predictive Value	95%	99%	96%
Comparison of Sensitivity, Specificity, positive Predictive value and Negative Predictive Value			

The efficacy of oligohydramnios (AFI ≤ 5 cm) in predicting foetal distress and requirement of LSCS had a sensitivity of 84.6% and negative predictive value of 96%. But the specificity and positive predictive value were poor. So this can be considered as a screening test for occurrence of fetal distress in intrapartum period requiring caesarean delivery.

The rate of LSCS was more in those with oligohydramnios and non reactive NST (100%). Even with reactive NST 13.3% develop fetal distress and LSCS was done. In control group women with non reactive NST had 100% caesarean rate and with reactive NST had only 2% of caesarean rates.

APGAR Score: The 1 min APGAR score 6.8 study group and 6.7 in control group. The 5 min APGAR score 8.8 in study group and 8.7 in control group. The APGAR score < 7 is seen in 4% of oligohydramnios group. Whereas 5 min APGAR less than 7 in other studies like Rutherford te al¹³, Chandra P et al¹⁰, Sriya R et al¹¹ are 23%, 23.07% and 9.72% and 9.72% respectively.

Birth weight: The mean birth weight was 2.64 kg in study group and 2.74 kg in control group the difference of which is not very significant.

Admission to Neonatal Ward: Four percent of newborns were admitted in neonatal ward for various morbidities like birth asphyxia, meconium aspiration etc. It is comparable to studies conducted by Magaan et al (7.6%)⁸ and Casey et al (7%).¹² Studies by Chandra P et al and Sriya R et al showed high incidence of NICU admission i.e. 46.15% and 88.88% respectively. Among cases and controls, there were no neonatal deaths. In Chandra P et al¹⁰ study, death occurred in one case. In study by Baron et al⁷ and Casey et al¹², there were no mortality probably because of good neonatal intensive care unit facilities. In the control group (AFI 8–20 cm), 2% had non reactive NST. 8% had thick meconium stained liquor and 4% caesarean section rates.

Induction-Delivery Interval: Induction- delivery interval was less than 6 hrs in 14 (50%) in study group and 8 (44.4%) in control group. In control group, 3 (16.7%) patient delivered after 12 hrs compared to study groups 2 (7%).

CONCLUSION

An amniotic fluid index of < 5 cm detected after 37 completed weeks of gestation in a low risk pregnancy is an indicator of poor pregnancy outcome. In the process of oligohydramnios, the occurrence of no reactive NS, abnormal FHR tracings during labor, thick meconium stained liquor, development of foetal distress, the rate of LSCS, low 5 min APGAR score, low birth weight and perinatal mortality are high. (In our study, the rate of LSCS, meconium stained liquor, non reactive NST, abnormal FHR tracing during labour, development of fetal distress, NICU admission are more Except for increased LSCS rates, in the rest of parameters no statistical significant difference exist between study and control groups. Determination of AFI can be used as an adjunct to other foetal surveillance methods. It is a valuable screening test for predicting foetal distress in labour requiring caesarean section. It has a sensitivity of 84.6% and negative predictive value of 96% specificity of 55% and positive predictive value of 22%.

REFERENCES

1. L. Yeo, M G. Ross, and A. M. Vintzileos, "Antepartum and intra-partum surveillance of the fetus and amniotic fluid," in clinical obstetrics: The fetus and Mother, pp 586-606, John Wiley and Son's, 3rd edition, 2008.
2. R. Liston, D Sawchuck, and D. Yopung. Fetal health surveillance: antepartum and intrapartum consensus guideline. *Journal of obstetrics and gynaecology Canada*, 2007;29(1):S3- S56.
3. A. A. Baschat, R. M. Viscardi, B. Hussey-Gardner, N. Hashmi, and C. Harman. Infant neurodevelopment following fetal growth restriction; Relationship with antepartum surveillance parameters. *Ultrasound in obstetrics and gynecology* 2009;33(4):44-50.
4. Beall MH, Van den Wijngaard JP, van Gernert MJ, Ross MG, Amniotic fluid water dynamics. *Placenta* 2007; 28(6): 816-23.
5. Magann EF, Sandlin AT, Ounpraseuth ST. Amniotic fluid and the clinical relevance of the sonographically estimated amniotic fluid volume: Oligohydramnios. *J Ultrasound Med* 2011;30(3): 1573- 85.

6. Phelan JP, Smith, Broussard, Small M. Amniotic Fluid Assessment with the four quadrant technique at 36-42 weeks gestation, *J Reprod Med* 1987;32(5):540-2.
7. Collen B, Morgan Mark A, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Am J Obstet Gynecol*. 1995; 173(2): 167-74.
8. Magaan EF, Chouhan SP, Kinsella MJ, et al. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. *Am J Obstet Gynecol*. 1999; 180(6): 1330-1336.
9. Kumar P, Iyer S, Ramkumar V. Amniotic fluid index – A new ultrasound assessment of amniotic fluid. *J Obstet Gynecol*. 1991; 41(1): 10-12.
10. Chandra P, Kaur SP, Hans DK, Kapila AK. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Obstet and Gynae Today*. 2000; 5(3):478-81.
11. Sriya R, Singhai S, et al. Perinatal outcome in patients with amniotic fluid index ≤ 5 cm. *J Obstet Gynecol India*. 2001; 51(5): 98-100.
12. Casey BM, McIntire DD, Donald D, et al. Pregnancy outcome after diagnosis of oligohydramnios at or beyond 34 weeks of gestation. *Am J Obstet Gynecol*. 2000;182(4):902-12.
13. Rutherford DE, Jeffrey P, Phelan J, Smith CV, Jacobs N. The four quadrant assessment of amniotic fluid volume: an adjunct to antepartum fetal heart rate testing. *Obstet Gynecol*. 1987;70(3): 353
14. Grubb DK, Paul RH. Amniotic fluid index and prolonged antepartum fetal heart rate decelerations. *Obstet Gynecol*. 1992;79(4):558-60.

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