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Low amniotic fluid index and intranatal and perinatal outcome in term pregnancy

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Abstract

Objective: Here we studied and compared perinatal outcome and mode of delivery in women with low AFI.

Methods: 105 singleton pregnancies with gestational age between 37 to 42 weeks with low AFI. The amniotic fluid index was determined in all cases using four quadrant technique. The cases were divided in two groups We studied the cases in terms of mode of delivery, abnormal fetal heart rate, meconium staining of liquor, APGAR score at 1 min and 5 min, birth weight, NICU admissions. We also studied the antenatal risk factors associated with low AFI.

Results: The group with oligohydramnios had more number of caesarean sections which was statistically significant (p=0.000).

Conclusion: Oligohydramnios with AFI less than or equal to 5 is associated with statistically significant high caesarean delivery rate. Adverse perinatal outcome in terms of meconium stained liquour, abnormal FHR, low birth weight, poor APGAR score at 1 and 5 minute are the complications of low AFI.

Keywords: oligohydramnios, perinatal morbidity, caesarean section

Introduction

Amniotic fluid is an important part of pregnancy sac and helps in foetal development [1]. It surrounds the foetus and provides protective low resistance environment suitable for fetal growth and development [2]. It also protects foetus from trauma, maintains body temperature and it has bacteriostatic properties. Its pressure helps in reducing the loss of lung fluid and assist in pulmonary development [3]. It supports development of musculoskeletal system by permitting foetal movements in addition to the growth and development of gastrointestinal system by swallowing amniotic fluid [1]. Umbilical cord compression is avoided due to adequate amniotic fluid thereby protecting the fetus from nutritional and vascular compromise. The amniotic fluid volume varies with the gestational age from 200ml at 16weeks, 1000ml at 28 weeks, 900ml at 36 weeks and 800ml at 40 weeks of gestation [4]. Amniotic fluid index (AFI) which is the semi quantitative measurement of amount of amniotic fluid is calculated by adding the depth in centimeters of the largest vertical pockets in each four quadrants [5]. Phelan [6] who described amniotic fluid index defined oligohydramnios as an AFI less than 5cm. Manning *et al*. [7] defined oligohydramnios when the largest pocket measured on ultrasound in its broadest diameter measured less than 1 cm. Moore and cayle defined oligohydramnios as an AFI below 5 th percentile for the gestational age. Incidence of oligohydramnios is reported to be 0.5 to 5% [8, 9] depending upon the criteria used to define oligohydramnios and the population studied. Oligohydramnios occurs in about 1 to 5 % of pregnancies at term [10]. A finding of diminished amniotic fluid index is generally perceived as a sign of placental insufficiency [12]. Sequelae of chronic oligohydraminos can be foetal demise, pulmonary hypoplasia, facial and skeletal deformities. Decreased liquor volume in labour may decrease volume of intervillous space which may predispose to umbilical cord occlusion, both of which increases the risk of foetal hypoxaemia and will affect the Apgar score of baby at birth. In high risk pregnancies, decline of AFI can be at a faster rate [1]. It has been observed that antepartum or intrapartum AFI I<5cm is associated with significant rise of risk to caesarean section for foetal distress and low Apgar at 5 minutes [14]. The umbilical cord compression during labour is common with oligohydraminos which increase the risk of caesarean delivery done for foetal distress and 5 minute Apgar of <7 [15]. The reduction of amniotic fluid volume is associated with increase in induction of labour, stillbirth, non-reassuring foetal heart rate pattern, meconium aspiration syndrome and neonatal death [16]. Determination of optimal time of delivery is necessary and labour should not be prolonged [17]. There is a consistent association between low AFI and conditions like pregnancy induced hypertension, postdated pregnancy and IUGR resulting in poor foetal outcome [18].

The chronically stunned foetus is likely to have low amniotic fluid because of shunting of blood to brain and heart leads to decreased renal blood flow which subsequently leads to decreased urinary output. Because primary component of amniotic fluid in third trimester is foetal urine, on-going chronic stress is recognized as oligohydraminos. It is well established that oligohydramnios is associated with a high risk of adverse perinatal outcome [20]. On the other hand oligohydramnios is a poor predictor for adverse outcomes [21]. In most studies oligohydramnios has been defined as an AFI

of 5 cm or less and its associated maternal and fetal complications are proven [22]. However, there are different views about the range of borderline AFI. In a study done by Phelan *et al*. borderline AFI is defined between 5 and 8 cm [23, 24]. Also, Gumus and Miller have defined a borderline AFI as an AFI of 5.1-10 [25]. In most reported studies, the pregnancies with borderline AFI of 5-10 cm have shown outcomes such as non-reactive non-stress tests, fetal heart rate (FHR) deceleration, meconium aspiration, immediate caesarean delivery, low Apgar score, LBW, NICU admission and SGA in comparison with control subjects with normal amniotic fluid level (8.1-18 cm) [26]. Also the low amniotic index may increase the operative delivery rate [27]. In our study we included 105, of which 50 cases had AFI equal to or less than 5 and 55 cases had AFI more than 5 and less than 8 and and we compared the perinatal outcome and mode of delivery in two groups, one having AFI less than 5 which is the oligohydramnios group and the other with AFI more than 5 and less than 8 which is the group with borderline AFI.

Materials and Methods

In our study we studied 105 cases of low amniotic fluid index which was prospective study carried over a period of 3 years. The inclusion criteria were singleton term pregnancy with gestational age between 37 to 42 weeks and having AFI of equal to less than 8, exclusion criteria were rupture of membranes and congenital malformations of the fetus, The eligible cases were recruited from OPD, IPD and labour room. After taking detail history along with enquiring for high risk factors for oligohydramnios complete examination was done. For all the women, ultrasound examination was done and amniotic fluid index was calculated by four quadrant Amniotic fluid volume measurement technique as described by Phelan *et al*.

Depending upon obstetric factors, investigations and clinical assessment, decision for elective caesarean section and induction of labour was taken in some patients. Patients with spontaneous and induced labour were monitored with cardiotocography in the intrapartum period. Maternal outcome in the form of mode of delivery, labour related events like abnormal fetal heart rate and caesarean section for fetal distress were studied. Perinatal outcome in the form of Apgar score at 1 minute and 5 minute, Birth weight, meconium staining of liquor and NICU admissions were studied. Results were tabulated and statistically analyzed. P value less than 0.05 was considered statistically significant.

Results and Observations

Graphical Presentation

Group 1: AFI Less than equal to 5
Group 2: AFI More than 5 less than equal to 8

1. Age in relation with AFI

Table 1

Age with AFI				
		AFI		Total
		Less than equal 5	More than 5	
Age	Less than 21	(12%)6	(14.54%)8	14
	21 - 25	(52%)26	(49.09%)27	53
	25 - 30	(36%)18	(32.72%)18	36
	More than 30	0	(3.63%)2	2
Total		50	55	105

(P = 0.558)

2. Parity in relation with AFI

Table 2

Parity with AFI				
		AFI		Total
		Less than equal 5	More than 5	
Parity	Nullipara	(62%)31	(65.45%)36	67
	P1	(32%)16	(21.81%)12	28
	P2	(6%)3	(12.72%)7	10
Total		50	55	105

(P = 0.315)

3. Gestational age with AFI

Table 3

		AFI		**Total**
		Less than equal 5	**More than 5**	
Gestational Age	less than equal 40	(68%)34	(72.72%)40	74
	more than 40	(32%)16	(27.27%)15	31
Total		50	55	105

(P= 0.596)

4. Mode of delivery with AFI

Table 4

Mode_of_Delivery - AFI				
		AFI		**Total**
		Less than equal 5	**More than 5**	
Mode_of_Delivery	Cesarean	(76%)38	(36.36%)20	58
	Normal	(24%)12	(63.63%)35	47
Total		50	55	105

(P =0.000)

5. Birth weight with AFI

Table 5

		AFI		Total
		Less than equal 5	**More than 5**	
BirthWeight	Less than 2.5	(36%)18	(27.27%)15	33
	Greater than equal 2.5	(64%)32	(72.72%)40	72
Total		50	55	105

(P = 0.336)

6. Neonatal outcome with AFI

Table 6

Neonatal_Outcome with AFI				
		AFI		Total
		Less than equal 5	More than 5	
Neonatal_Outcome	Mothers side	(68%)34	(78.18%)43	77
	NICU	(32%)16	(21.81%)12	28
Total		50	55	105

(P = 0.2239)

7. Indications for C-section with AFI

Table 7

		AFI		Total	P - value
		Less than equal 5	**More than 5**		
Indications for C-section	Non reactive fetal heart	25(65.78%)	13(65%)	38	
	CPD	5(13.15%)	2(10%)	7	
	Failed Induction	3(7.89%)	2(10%)	5	0.95
	Severe IUGR	4(10.52%)	3(15%)	7	
	Anhydramnios	1(2.63%)	-	1	
Total		38	20	58	

8. MSL with AFI

Table 8

MSL with AFI				
		AFI		**Total**
		Less than equal 5	**More than 5**	
MSL	MSL	(28%)14	(16.36%)9	23
	Non MSL	(72%)36	(83.63%)46	82
Total		50	55	105

(P = 0.150)

9. Risk Factors with AFI

Table 9

		AFI	
		Less than equal 5(N=50)	**More than 5 less than 8 (N=55)**
Risk Factors	PIH	19(38%)	18(32..72%)
	IUGR	17(34%)	15(27.27%)
	Abruption	3(6%)	3(5.45%)
	Severe Anaemia	2(4%)	2(3.63%)
	Prolonged Pregnancy	10(20%)	10(18.18%)
	Isolated (no risk Factors)	14(28%)	22(40%)
	Smoking	3(6%)	3(5.45%)

10. APGAR Score @1min with AFI

Table 10

		AFI		Total	P - value
		Less than equal 5	More than 5		
APGAR@1min	Less Than 7	9(18%)	6(10.90%)	15	
	More Than 7	41(82%)	49(89.09%)	90	0.300
Total		50	55	105	

11. APGAR Score @5min v/s AFI

Table 11

		AFI		Total	P - value
		Less than equal 5	More than 5		
APGAR@5min	Less than 7	14(28%)	8(14.54%)	22	
	More than 7	36(72%)	47(85.45%)	83	0.091
Total		50	55	105	

Observations

There was no statistical difference in age, parity and gestational age in both the groups. 63.81% were nulliparous women in our study.Cesarean was performed in 44.76% women while 55.24% women had normal vaginal delivery. 26.67% newborns needed NICU admissions. 31.43% neonates had birth weight less than 2.5 kg, 14% neonates had APGAR score less than 7 at 1 minute and 21% neonates were with APGAR score less than 7 at 5 minute. 22% cases out of total no of cases had shown Meconium stained liquor.

58 women who underwent cesarean section 65% were for non- reactive fetal heart rate pattern on cardiotocography, 12% for CPD, 9% for failed induction, 12% for severe IUGR, 2% had anhydrmnios as an indication for caesarean section.35.23 % cases had PIH as an antepartum risk factor associated with low AFI and in 34.28 % cases there were no risk factors to have low AFI.

Discussion

Total 105 cases were included in the study, of which 50 cases had AFI equal to or less than 5 and 55 cases had AFI more than 5 and equal to or less than 8 There was no statistical difference in age, parity and gestational age in both the groups. In our study 62 %women in the oligohydramnios group were nulliparous, in the group with borderline liquor 65.45 % women were nulliparous. Overall 63.81 % cases were nulliparous In a similar study by Pradip Gaikwad [28]. 63.2% women were nulliparous in group with oligohydramnios and 36.7% were multiparous in the group with borderline liquor 62.7%were nulliparous and 37.2% were multiparous with no statistical difference in parity between two groups (p=0.97) and the results were found simillar to our study. In our study distribution of gestational age was studied and 68 % women in the group with oligohydramnios had gestational age less than or equal to 40, 32 % women had gestational age more than 40. In the group with borderline liquor 72.72% women had gestational age less than or equal to 40, 27.27 % women had gestational age more than 40, with no statistical significant difference in gestational age in both the groups(p=0.596).Mean gestational age in the group with oligohydramnios was 38.86 ± 1.44 and in the group with borderline liquor was 38.88 ± 1.24. and overall 70.48% women had gestational age less than or equal to 40 weeks and 29.52% had gestational age is more than 40 weeks.

In a simillar study by Pradip Gaikwad [28] mean gestational age in the group with oligohydramnios was found comparable to our study with 37.95 weeks and 37.49 weeks in group with borderline AFI and the difference in gestational age was not found significant (p=0.33).

In our study mode of delivery was compared between the two groups and it was found that in group with oligohydramnios 76%women underwent caesarean section and 24%women underwent normal delivery, in group with borderline liquor 36.36 %women underwent caesarean section and 63.63%women had normal delivery, a statistically significant difference was observed for caesarean section in oligohydramnios with AFI ≤ 5cm group compared to borderline liquor group in our study (p=0.000), none of the cases had instrumental vaginal deliveries in our study overall 44.76%women in our study underwent caesarean section and 55.24 % women had full term normal vaginal delivery. Pradip Gaikwad *et al*. [28] did a similar study and the results were on comparison of mode of delivery in between both the groups, a statistically significant difference was observed for caesarean section in oligohydramnios with AFI ≤ 5cm group compared to AFI of 5.1 to 8 cm group and caesarean section was performed in 73.4%in the group with oligohydramnios and37.2% in the group with borderline liquor, 26.4 %women had vaginal deliveries including instrumental vaginal deliveries in group with oligohydramnios and in the other group 62.7%women had vaginal deliveres including instrumental deliveries and the results were found simillar to our study. Haifa *et al*. [29] and Chate *et al*. [30] reported that the overall cesarean section rate was significantly higher in the group with AFI ≤5 cm as compared to AFI > 5 cm. We compared apgar score at 1 minute (<7) and at 5 minute (<7) and found that There were 18 % neonates in oligohydramnios group and 10.9 % neonates in borderline AFI group with apgar score less than 7 at 1 minute(p=0.3). 28 % neonates in oligohydramnios group and 14.54 % neonates in borderline afi group had apgar score less than 7 at 5 minute.(P=0.09) and difference was not found statistically significant. Overall

14.28% neonates had apgar score less than 7 at 1 minute and 20.95% neonates had apgar score less than 7 at 5 minute.

In study by Halfia *et al*. [29]. incidence of low apgar score (<7) at 1 minute was statistically significant in oligohydramnios group. Chate *et al*. also reported no significant difference in incidence of a Apgar score of <7 at 1 min and 5 min [30].

We studied the perinatal outcome in the two groups and compared the NICU admissions in both the groups and in our study 32 % of neonates had NICU admissions in oligohydramnios group compared to 21.81 %in the borderline AFI group and difference was not found to be statistically significant in between the two groups (p=0.239), 26.67% of NICU there was no neonatal death in our study. Pradip Gaikwad *et al*. [28] did a simillar study and studied perinatal outcome in relation to NICU admissions between the two groups of oligohydramnios and borderline liquor and in their study NICU admission rate was 24% and there was no statistically significant difference (p=0.53), admission to NICU was statistically significant (p= 0.043) in AFI ≤5 cm group in the study by Hafia *et al*. [29]. Chate *et al*. also reported that the incidence of admission to NICU was significantly higher in AFI ≤5 cm group [30]. In our study meconium staining of liquor was compared between the two groups and 28 % women in oligohydramnios group and 16.36 % women in borderline AFI group had MSL ($p =$ 0.15) but the difference was not statistically significant. Overall 21.90 % cases had MSL. Pradip Gaikwad *et al*. [28] found Meconium staining of liquor in 36.73% of oligohydramnios and 25.4% of borderline AFI, but the difference was not statistically significant. Mean birth weight in the group with oligohydramnios was 2.59 ± 0.40 and in the other group was 2.70 ± 0.47 and overall, 31.43% neonates had birth weight is less than 2.5 kg [28] in a study by Pradip Gaikwad results were simillar to our study with no statistical significant difference with respect to low birth weight in two groups (p=0.85). Fetal distress was the indication for caesarean section in 65.78% women in oligohydramnios group and in 65 % women in the group with borderline AFI. Pradip Gaikwad [28] did a simillar study and found that the indication for caesaerean section was fetal distress in 34.6% cases of oligohydramnios and in 11.7% cases in cases of borderline AFI and the difference was found to be statistically significant (p<0.05).

The commonest indication for cesarean section in both the groups was fetal distress which was comparable to our study. The rate of non-reactive fetal heart rate pattern was significantly higher in AFI ≤5 cm group as compared to AFI 5.1 to 20 cm in the study by Chate *et al*. [30] (p=0.04).Haifa el al [29] also reported that, more cesarean sections were performed for fetal distress in the group with AFI ≤5 cm as compared to AFI > 5 cm (p < 0.0001). 35.23% cases had PIH as antepartum risk factor for low AFI in our study and 34.28% cases had no risk factors in our study.

The results were similar to the study done by Pradip Gaikwad [28] in which the antepartum high risk factors associated with low AFI were studied which included pregnancy induced hypertension in 31% of cases In 40% of the cases no obvious high risk factors (isolated oligohydramnios) were observed

Conclusion

It is concluded from the present study that amniotic fluid index of less than or equal to 8 is associated with adverse perinatal outcome in form of meconium stained liquor, non-reassuring fetal heart rate, low birth weight, poor APGAR score at 1 and 5 minute, necessity of resuscitation of different grades and NICU admissions. Patients with low AFI needed caesarean sections to prevent the perinatal mortality and morbidity along with close antepartum and intrapartum monitoring.

We conclude that determination of AFI can be used as an adjunct to other fetal surveillance methods and oligohydramnios with AFI less than or equal to 5 is associated with statistically significant high caesarean section rate

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References

1. Ever HF. Comparalibity of amniotic fluid index and single deepest pocket measurements in clinical practice. Aus NJ J Obs and Gynecol. 2003; 43:75-7.
2. Volent E, Llimi G. Alteration of amniotic fluid and neonatal outcome. Acta Biomed. 2004; 75(1):71-5.
3. Nicolini U, Fisk NM, Rodeck CLI. Low amniotic pressure in oligohydramnios- Is this cause of pulmonary hypoplasia. Am J Obstet Gynecol. 1989; 161(5):1098-101.
4. Gary CF, Leveno KJ, Bloom SL, Hauth JC, Gilstrap L, Wenstorm KD. Disorders of Amnionic Fluid Volume. In: William Obstetrics, 23rd Edn., New York: McGraw Hill. 2010, 491.
5. Patel PK, Pitre DS, Gupta H. Pregnancy outcome in isolated oligohydramnios at term. Ntl J of Community Med. 2015; 6(2):84-88.
6. Grubb DK, Paul RH. Amniotic fluid index and prolonged antepartum fetal Grubb DK, Paul RH. Amniotic fluid index and prolonged antepartum fetal heart rate decelerations. Obstet Gynecol. 1992; 79:558-60.
7. Chauhan SP, Sanderson M, Hendrix NW, Magann EF, Devoe LD. Perinatal outcome and amniotic fluid index in the antepartum and intrapartum periods: A meta-analysis. Am J Obstet Gynecol. 1999; 181:1473-8.
8. Hill LM, Breckle R, Wolfgram KR, O'Brien PC. Oligohydramnios; ultrasonically detected incidence and subsequent foetal outcome. Am J Obstet Gynecol. 1983; 147:407-10.
9. Mercer LJ, Brown LG, Petres RE, Messer RH. A survey of pregnancies complicated by decreased amniotic fluid. American Journal of Obstetrics and Gynaecology. 1994; 149:355-61.
10. Moore TR. Clinical assessment of amniotic fluid. Clin obstet Gynecol. 1997; 40:303-313.
11. Phelan JP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment with the four – quadrant technique at 36-42 week, gestation. J Reprod Med. 1987;

32:540-542.
12. Desai PK. Decrease in amniotic fluid index in low risk pregnancy. Any significance? J Obstet Gynecol Ind. 2004; 54(5):464-6.
13. Bank EH, Miller DA. Perinatal risks associated with borderline AFI. Am J Obstet Gynecol. 1999; 180(6Pt 1):1461-3.
14. Chauhan SP, Sanderson M, Hendrix NW, Magann EF, Devoe LD. Perinatal outcome and AFI in antepartum and intrapartum period-a meta analysis. Am J Obstet Gynecol. 1999; 181(6):1473-8.
15. Chauhan SP, Sanderson M. Perinatal outcome and AFI in antepartum and intrapartum period- a meta analysis. Am J Obstet Gynecol. 1999; 181(6):1473-8.
16. Casey BM. Pregnancy outcome after antepartum diagnosis of oligohydramnios at or beyond 34 weeks of gestation. Am J Obstet Gynecol. 2000; 182:909-12.
17. Kawasaki N, Nishimura H, Yoshimura T, Okamura H. A diminished intrapartum amniotic fluid index is a predictive marker of possible adverse neonatal outcome when associated with prolonged labor. Gynecol Obstet Invest. 2002; 53(1):1-5.
18. Magnann F. Does an amniotic fluid index of 5 cm necessitate delivery in high risk pregnancies? Am J Obstet Gynecol. 1999; 180:1354-9.
19. Evere HF, Magnann. Oligohydramnios at term and pregnancy outcome. Fetal and maternal medicine review. 2001; 12(3):209-27.
20. Chauhan SP, Sanderson M, Endrix NW, Magann EF, Devoe LD. Perinatal outcome and amniotic fluid index in the antepartum and intrapartum periods : a meta analysis. Am J Obset Gynecol. 1999; 181:1473-1478. Casey BM, McIntire DD, Bloom SL *et al*. Pregnancy out-come after 34 weeks gestation Am J Obstet Gynecol. 2000; 182:909-912.
21. Philipson EH, Sokoj RJ, Williams T. Oligohydramnios: clinical association and predictive value for intrauterine growth retardation. Am J Obstet Gynecol. 1983; 146:271-278. Magann EF, Chauhan SP, Kinella MJ, McNamara MF, Whitworth NS, Morrison JC. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. Am J Obstet Gynecol. 1999; 180(6 pt 1):1330-6.
22. Phelan JP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment with the four-quadrant technique at 36-42 weeks' gestation. J Reprod Med. 1987; 32:540-542. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The 4 quadrant assessment of amniotic fluid volume: An adjunct to antepartum fetal heart rate testing. Obstet Gynecol. 1987; 70:353-356.
23. Kwon JY, Kwon HS, Kim YH, Park YW. Abnormal Doppler velocimetry is related to adverse pregnancy outcome for borderline amniotic fluid index in the third trimester. J Obstet Gynecol Res. 2006; 32:545-549.
24. Haas DM, Magann EF. External cephalic version with an amniotic fluid index <or =10: a systematic review. J Matern Fetal Neonatal Med. 2005; 18:249-252.
25. Gumus II, Koktener A, Turhan NO. Perinatal outcome of pregnancies with borderline amniotic fluid index. Arch Gynecol Obstet. 2007; 276:17-19. Banks EH, Miller DA. Perinatal risks associated with borderline amniotic fluid index. Am J Obstet Gynecol. 1999; 180:1461-1463.
26. Kwon JY, Kwon HS, Kim YH, Park YW. Abnormal Doppler velocimetry is related to adverse pregnancy outcome for borderline amniotic fluid index in the third trimester. J Obstet Gynecol Res. 2006; 32:545-549. Baron C, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. Am J Obstet Gynecol. 1995; 173:167-174.
27. Karim R, Jabeen S, Pervaiz F, Wahab S, Yasmeen S, Raees M. Decreased amniotic fluid index and adverse pregnancy outcome at term. JPMI. 2010; 4:307-311.
28. Pradip R. Gaikwad: Perinatal outcome in oligohydramnios and borderline amniotic fluid index: a comparative study**:** International Journal of Reproduction, Contraception, Obstetrics and Gynecology Gaikwad PR *et al*. Int J Reprod Contracept Obstet Gynecol. 2016; 5(6):1964-1968.
29. Haifa Alchalabi A, Basil Obeidat R, Mohammed Jallad F, Yousef Khader S. Induction of labor and perinatal outcome: The impact of the amniotic fluid index. European Journal of Obstetrics &Gynaecology and Reproductive Biology. 2006; 129(2):124-7.
30. Chate P, Khatri M, Hariharan C. Pregnancy outcome after diagnosis of oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2013; 2(1):23-6.