International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Chetani M et al. Int J Reprod Contracept Obstet Gynecol. 2017 Aug;6(8):3280-3286
www.ijrcog.org

pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20173083

Original Research Article

A Clinical study of amniotic fluid index at or beyond 28 weeks of gestation and its relation to perinatal outcome

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Received: 18 June 2017
Accepted: 23 June 2017

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ABSTRACT

Background: Amniotic fluid plays a major role in the development of fetus. It provides a medium in which fetus can readily move, cushions the fetus against injuries, helps to maintain even temperature. Objective of present study was to investigate the perinatal outcome of ultrasonographically detected normal and decreased (Oligohydramnios) amniotic fluid index, at or beyond 28 weeks of gestation.
Methods: During this study 200 patients with singleton pregnancy were selected at or beyond 28 weeks of pregnancy and AFI was evaluated. On the basis of AFI measurement patients were divided in two groups. Perinatal outcome in pregnancies with AFI of <5cm were compared with those with normal AFI.
Results: There was significant correlation ($p<0.001$) between oligohyramnios and poor perinatal outcome. Incidence of LSCS, meconium stained liquor and low apgar score has significant correlation in patients with oligohydramnios. Incidence of low birth weight babies, NICU admissions and perinatal death was more were more are more in oligohydramnios cases. This is statistically significant ($p<0.001$).
Conclusions: AFI <5 cm at or beyond 28 weeks of gestational age in an indicator of poor perinatal outcome. AFI measurement in antepartum or intrapartum period can help to identify women who need increased antepartum surveillance for pregnancy complications and such women should be managed in a special unit to combat the complications effectively.

Keywords: Amniotic fluid, Gestation, Oligohydramnios

INTRODUCTION

Amniotic fluid plays a major role in the development of fetus. It provides a medium in which fetus can readily move, cushions the fetus against injuries, helps to maintain even temperature. It also plays a role in dilatation of cervix during labour. Adequate amniotic fluid helps in permitting extension of limbs and prevents joint contractures. It prevents the compression of the umbilical cord, placenta and protects the fetus from vascular and nutritional compromises. In 1989, Brace and Wolf demonstrate a progressive increase in the AFV from 10 to 22weeks gestation.[1] From 22 to 39 weeks gestation the AFV remained stable (averaging 777 ml with a 95% confidence interval of 302 to 1997 ml) and then gradually declined. Amniotic fluid is approximately 7ml at 8 weeks, 30ml by 10 weeks, 190ml by 16 weeks and mean of 780ml by 32-35weeks then decreasing to about 400-450ml by 42weeks.

After 40 weeks amniotic fluid decreases at a rate of 8% per week and averages only 400-450ml at the end of the

42 weeks. It reduces further to a mean of 250ml and 160ml at 43 and 44 weeks respectively. The net turnover of amniotic fluid is about l000ml/day.[2] Abnormalities of the amniotic fluid volume can interfere directly with the fetal development or may be an indirect sign of underlying disorder. Oligohydramnios can be associated with fetal congenital anomalies and Intrauterine Growth Retardation (IUGR). It is usually directly proportional to the degree of IUGR and it indicates placental dysfunction. Oligohydramnios can also cause asymmetrical fetal growth, contracture of the joints and hypoplasia of fetal lungs by decreasing the lung expansion due to compression of the fetal abdomen which limits the movements of the fetal diaphragm and decreases the flow of the amniotic fluid into and out of the fetal lung. Over the past decades, a number of sonographic methods have been used to measure the amniotic fluid. Phelan et al described quantification of amniotic fluid using the amniotic fluid index (AFI).[2] The four-quadrant technique termed AFI is in which a vertical pocket of amniotic fluid, free of umbilical cord, in each of four equal uterine quadrant was summated.

Oligohydramnios

An amniotic fluid volume more than two standard deviation below the mean for specific gestational age or volume reduced below the 5th percentile for particular gestational age would define Oligohydramnios. Based on this definition, volume <300ml at term would constitute Oligohydramnios. According to Phelan et al Oligohydraminos is defined by AFI <5cm.[2]

Objective of present study was to investigate the perinatal outcome of ultrasonographically detected normal and decreased (Oligohydramnios) amniotic fluid index, at or beyond 28 weeks of gestation.

Amniotic fluid indices as described by Phelan et al are Given in Table 1.[3]

Table 1: Amniotic fluid indices

AFV	AFI (cm)
Oligohydramnios	<5
Borderline	5.1-8
Normal	8.1-24.0
Polyhydramnios	>24

METHODS

The study was conducted in Department of Obstetrics and Gynaecology, P.B.M. Hospital, Sardar Patel Medical College, Bikaner. During this study 200 patients with singleton pregnancy were selected at or beyond 28 weeks of pregnancy and AFI was evaluated in those patients with technique of Phelan et al.[2]

AFI <5 cm at or beyond 28 weeks of gestational age in an indicator of poor perinatal outcome. On the basis of AFI measurement patients were divided in two groups. Group one, those who had AFI <5cm and group 2 with normal AFI (8-24cms). Perinatal outcome in pregnancies with AFI of <5cm were compared with those with normal AFI. Finally, AFI was evaluated as predictor of neonatal outcome by calculated % positive and negative predictive value of AFI for the selected outcomes. On the basis of AFI measurement patients were divided in two groups. Group one, those who had AFI <5cm and group 2 with normal AFI (8-24cms). Perinatal outcome in pregnancies with AFI of <5cm. were compared with those with normal AFI. Finally, AFI was evaluated as predictor of neonatal outcome by calculated % positive and negative predictive value of AFI for the selected outcomes.

Pregnant women with gestational age of 28 weeks or beyond attending ANC clinic, labour room, booked and unbooked patients were included in the study. It was a comparative non-randomized study.

Sample Size was

- Group 1 Oligohydramnios - 100
- Group 2 Normal AFI – 100

Inclusion criteria

- All pregnant women with gestation age of 28 weeks or more, willing to participate in the study are included with written and informed consent.

Exclusion criteria

- Pregnant women with gestation age of less than 28 weeks
- Polyhydramnios
- Multiple pregnancy
- Placenta previa
- Fetal congenital anomalies
- Patients with ruptured membranes
- Abnormal presentations and positions

Technique of amniotic fluid index assessment

- Supine position.
- A linear, curvilinear or sector transducer can be used.
- Divide the uterus into 4 quadrants using the maternal sagittal midline vertically and an arbitrary transverse line approximately halfway between symphysis pubis and upper edge of uterine fundus.
- Transducer must be kept parallel to the maternal sagittal plane and perpendicular to the maternal coronal plane throughout.
- The deepest unobstructed (free of umbilical cord or fetal parts) and clear pocket of amniotic fluid is visualized and the image frozen. Ultrasound calipers are manipulated to measure the pocket in a strictly vertical direction.

- The process was repeated in each four quadrants and pocket measurement summed, which gives AFI. If AFI is less than 8, perform the four quadrant evaluation 3 times and average the values.

The end points used to judge perinatal outcome are:

- Fetal distress predicted by abnormal FHR, meconium stained liquor.
- One minute and 5 minute Apgar score judged by paediatrician APGAR score less than 7 will be considered as abnormal.
- Frequency of admission to NICU
- IUGR- baby weight of less than 10th percentile for gestation age
- Perinatal mortality.

RESULTS

The present study was conducted in Department of Obstetrics and Gynaecology, S.P. Medical College and Associated Group of Hospitals, Bikaner, consisting of 200 patients.

In which 100 patients having AFI <5 were labeled as study group and 100 patients having normal AFI (8-24cms). Cases were selected by taking into consideration all inclusion and exclusion criteria.

In this study, following observation were drawn:

Table 2: Distribution of cases according to maternal age group (years) between study and control groups.

Age group (years)	Study group		Control group	
	No. of cases	%	No. of cases	%
≤20	29	29.0	12	12.0
21-25	58	58.0	68	68.0
26-30	10	10.0	18	18.0
>30	3	3.0	2	2.0
Total	100	100	100	100
Mean	22.87		23.58	
SD	3.38		3.20	
T	1.525			

The distribution of cases according to maternal age group (years) between Study and Control groups. Most common age group in the present study was 21-25 years, 58 cases were in study group and 68 cases were in control group (Table 2).

According to antenatal booking status, 60 females in study group and 71 females in control group were booked while 40 females in study group and 29 females in control group were unbooked.

On applying chi square test, the difference was found to be statistically insignificant (p>0.05). Mean age in study group was 22.87±3.38 and in control group was 23.58±3.20 and the difference was found to be insignificant (p>0.05) (Table 3).

Table 3: Distribution of cases according to antenatal booking status between study and control groups.

Booked/unbookd	Study group		Control group	
	No. of cases	%	No. of Cases	%
Booked	60	60.0	71	71.0
Unbooked	40	40.0	29	29.0
Total	100	100	100	100
χ^2	2.677			
P	0.102			

Table 4: Distribution of cases according to gravidity between study and control groups.

Gravida	Study group		Control group	
	No. of cases	%	No. of cases	%
1	63	63	59	59
2	18	18.0	19	19.0
3	5	5.0	11	11.0
>4	14	14.0	11	11.0
Total	100	100	100	100
Mean	1.81		1.74	
SD	1.38		1.04	
T	0.404			
P	0.686			

According to gravidity, 63 females in study group and 59 females in control group were primigravida, 18 and 19 females in study and control groups were 2nd gravida respectively, 5 and 11 females of study and control group were 3rd gravida respectively while 14 cases in study group and 11 cases in control group were of gravida ≥4. On applying chi square test, the difference was found to be statistically insignificant(p>0.05) (Table 4).

Table 5: Distribution of cases according to gestational age (weeks) between study and control groups.

Gestational Age	Study group		Control group	
	No. of cases	%	No. of cases	%
28-29 weeks+6 days	1	1.0	0	-
30-31 weeks+6 days	2	2.0	0	-
32-33 weeks+6 days	2	2.0	0	-
34-35 weeks+6 days	4	4.0	2	2.0
36-37 weeks+6 days	16	16.0	10	10.0
38-39 weeks+6 days	44	44.0	58	58.0
40-42 weeks	31	31.0	30	30.0
Total	100	100	100	100
Mean	38.18		38.70	
SD	2.35		1.33	
T	1.929			
P	0.055			

Mean gestational age in study group was 38.18±2.35 weeks while in control group it was 38.70±1.33 weeks and the difference was found to be statistically insignificant (p>0.05) (Table 5).

Table 6: Distribution of cases according to onset of labour between study and control groups.

Labour	Study group		Control group	
	No. of Cases	%	No. of Cases	%
Spontaneous	48	48.0	73	73.0
Induced	52	52.0	27	27.0
Total	100	100	100	100
χ^2	13.077			
P	<0.001			

Table 6 shows distribution of cases according to Onset of Labour in study and control groups. 52 females of study group and 27 females of control group needed induction of labour. Spontaneous onset of labour was observed in 48% cases in study group and 73% cases in control group.

Table 7: Distribution of cases according to nature of amniotic fluid between study and control groups.

Nature of amniotic fluid	Study group		Control group	
	No. of cases	%	No. of cases	%
Clear	54	54.0	80	80.0
Thick MSL	6	6.0	2	2.0
Thin MSL	40	40.0	18	18.0
Total	100	100	100	100
χ^2	15.390			
P	<0.001			

On applying chi square test, the difference was found statistically highly significant (p<0.001) which implies that more patients with oligohyramnios were induced.

Majority of females had clear amniotic fluid (54% study group and 80% control group). Thick MSL was present in 8 females and out of them 6 cases were in study group and 2 belonged to control group. Thin MSL was present in 58 females and out of them 40 and 18 were belonged to study group and control group respectively and this difference was found to be statistically highly significant (p<0.001). This suggests that meconium stained liquor was more in oligohydromnios group (Table 7).

According to Mode of delivery, 45% cases in study group and 76% cases in control group had normal vaginal delivery while 54% cases in study group and 23% cases in control group had LSCS. Only 2 females had forceps delivery and out of them 1 each belonged to study and control groups. On applying chi square test, the difference was found to be statistically highly significant (p<0.001). Rate of LSCS was more in oligohydramniosgroup (Table 8).

Table 8: Distribution of cases according to mode of delivery between study and control groups.

Mode of delivery	Study group		Control group	
	No. of cases	%	No. of cases	%
Normal vaginal	45	45.0	76	76.0
Forceps	1	1.0	1	1.0
LSCS	54	54.0	23	23.0
Total	100	100	100	100
χ2	20.423			
P	<0.001			

Table 9: Various indications of LSCS between study and control groups.

Indication	Study group		Control group	
	No. of cases	%	No. of cases	%
Fetal distress	30	55.6	5	21.7
IUGR	16	29.6	2	8.7
PROM with non progress of labour	2	3.7	4	17.4
CPD	0	0	3	13.1
Failure of induction	2	3.7	4	17.4
Previous LSCS in labour	4	7.4	5	21.7

According to various indications of LSCS; fetal distress was present in 55.6% cases in study and 21.7% cases in control group. IUGR was present in 16 cases of study and 2 cases of control group Fetal distress leading to LSCS is more in oligohydramniosgroup (Table 9).

Table 10: Distribution of cases according to fetal outcome between study and control groups.

Fetal outcome	Study group		Control group	
	No. of cases	%	No. of cases	%
Live	94	94	99	99
Still Birth	5	5.0	1	1.0
IUD	1	1.0	0	-
Total	100	100	100	100
χ2	3.796			
P	0.150			

According to fetal outcome, out of total 200 babies there were 7 fetal death, out of them 6 were in study group and 1 was from control group. The difference was found statistically insignificant (p>0.05). The reason to this may be due to small number of patients in present study (Table 10).

According to Apgar score at 1 minute 33 cases in study group and 18 cases in control group had apgar score <7. The difference was found to be statistically significant (p<0.05). 14 cases in study group and 4 cases in control group belonged to Apgar score ≤ 7 at 5 minutes. This difference was also found to be significant (p<0.01). Low Apgar score was observed in oligohydroamnios group (Table 11).

Table 11: Distribution of cases according to Apgar Score between study and control groups.

Apgar Score (≤7)	Study Group		Control Group		χ^2	P
	No. of cases	%	No. of cases	%		
At 1 minute	33	33.0	18	18.0	5.9218	<0.05
At 5 Minutes	14	14.0	4	4.0	6.105	<0.01

Table 12: Distribution of cases according to baby birth weight (kg) between study and control groups.

Birth weight (kg)	Study group		Control group	
	No. of cases	%	No. of cases	%
1.0-1.5	4	4.0	0	-
1.6-2.0	2	2.0	0	-
2.1-2.5	36	36.0	22	22.0
2.6-3.0	43	43.0	51	51.0
3.1-3.5	15	15.0	26	26.0
>3.5	0	-	1	1.0
Total	100	100	100	100
Mean	2.65		2.86	
SD	0.43		0.31	
T	3.991			
P	<0.001			

Table 12 shows distribution of cases according to baby birth weight (kg) in relation to study and control groups. Mean birth weight in study group was 2.65±0.43 and in control group was 2.86±0.31 and the difference was found to be statistically highly significant (p<0.001).

Table 13: Distribution of cases according to NICU admission between study and control groups.

NICU admission	Study group		Control group	
	No. of cases	%	No. of cases	%
No	62	62.0	88	88.0
Yes	38	38.0	12	12.0
Total	100	100	100	100
χ^2	18.027			
P	<0.001			

According to NICU admission, 50 babies were admitted in NICU. Out of them 38 cases were in study and 12 cases were in control group and this difference was also found to be statistically highly significant (p<0.001). NICU admission was more in oligohydroamnios patients (Table 13).

According to perinatal mortality, out of total 200 deliveries 12 babies expired. 10 of these babies were of study group. This difference was found to be statistically significant (p<0.05).

Table 14: Distribution of cases according to perinatal mortality between study and control groups.

Perinatal mortality	Study group		Control group	
	No. of cases	%	No. of cases	%
No	90	90.0	98	98.0
Yes	10	10.0	2	2.0
Total	100	100	100	100
χ2	5.674			
P	0.017			

DISCUSSION

This study was carried out to determine the usefulness of AFI in predicting adverse perinatal outcome. In the study by Ghike et al mean age of women in study group was 24.65±4.1 and in controls was 24.00±4.2 which is comparable to present study.[4] In present study 60% cases in study group and 71% cases in control group were booked. 40% and 29% cases in study and control groups were unbooked respectively. The difference in both groups was found to be statistically insignificant (p>0.05). Early detection and reference with timely intervention will improve the maternal and perinatal outcome. Majority of women in both groups were primigravida. The mean gravidity in present study is 1.81 and 1.74 in study and control group respectively which is comparable to mean gravidity of 2 in study by Baron et al.[5] In their study Garmel et al observed that 67% of women with oligohydramnios were primigravida while we observed 63% of the women were primigravida in oligohydramnios group which is comparable.[6]

In present study, there was no significant relation between maternal age, ANC booking, education status, residential area, socioeconomic status, gravidity and incidence of oligohydroamnios. However, the results of

this study cannot be generalized as this study was done on a small sample size.

The mean gestational age in our study was 38.18 weeks in study group and 38.70 weeks in control group which is comparable to mean gestational age of 37.5 weeks in a study by Casey et al (Table 5).[7] There was no significant difference according to gestational age in study and control groups.

In present study, induction of labour was more in oligohydramnios group that is 52% compared to 27% in control group. This difference was found to be statistically highly significant (p<0.001) (Table 6). Casey et al, in their study also found higher rate of induction in patients with oligohydraminos i.e. 42%.[7] In the other studies like Rainford et al, Jandial et al, Gumus et al, also found higher incidence of induction of labour in patients with oligohydraminos.[8-10] Uteroplacental insufficiency and fetal compromise leading to higher rate of induction in pregnancy with oligohydramnios.

The incidence of meconium stained liquor was high in study group. In our study MSL was present in 46% of case in study group as compared to 20% cases in control group. This difference was found to be statistically highly significant (p<0.001) (Table 7). Similar results are found in study by Jandial et al who found MSL in 48% of women with oligohydramnios.[9] Our study is also supported by Crowley et al, who found statistically significant increase in MSL in patients with reduced amniotic fluid volume.[11] Similarly, Rutherford et al[12], Ergun et al[13], Magann et al[14], Casey et al[7], also observed that MSL was significantly higher in patients with oligohydroamnios as compared with normal amniotic fluid index.[7,12-14]

This suggests that there is higher incidence of meconium stained liquor and poor placental reserve in oligohydramnios patients. In present study, 54% cases in study group delivered by LSCS while in control group 23% cases had LSCS. This difference was found to be statistically highly significant (p<0.001) (Table 8).

In present study, fetal distress was the most common reason for LSCS. 52.6% cases in study group and 21.7% cases in control group underwent LSCS for fetal distress (Table 8). Present result is supported by study done by Jandial et al found that LSCS was done in 56% cases.[9] Indication for LSCS was fetal distress in 42% cases in their study, similar to present study. So, the rate of LSCS for fetal distress was significantly higher in study than in control group.

In the studies conducted by Sarno et al, Conway et al and Sriya, the rate of LSCS for fetal distress was higher in cases when compared to controls which is similar to present observation.[15-17] Incidence of fetal distress in patients with oligohydraminos are high due to association of oligohydraminos with fetal compromise, head and cord compression, placental insufficiency, IUGR and poor tolerance of labour. So, the discovery of decreased AFV should alert the obstetrician to consider that women is at increased risk and should warrant increased antepartum surveillance and strict vigilance in labour.

In present study 5% babies in study group were still born as compared to 1% in control group. 1 baby suffered IUD in study group. In the study conducted by Jandial et al[9] who found 4% still born babies in patients with AFI <5cm which is similar to present study.

Fetal outcome is poor in pregnancies associated with oligohydraminos because of chronic placental insufficiency leading to fetal compromise and fetal distress. So, early detection of oligohydraminos can save babies and improve fetal outcome. Apgar score ≤7 at 1 minute was found in 33% cases in study group and 18% cases in control group. Apgar score ≤7 at 5min was found in 14% and 4% cases in study and control groups respectively. The difference was found to be significant (p<0.05) (Table 11). Present results are supported by study done by Jandial et al, in which Apgar score <7 at 5 minute was in 12% of cases of oligohydramnios group.[9] Similar results were also found by Rutherford et al.[12] The mean birth weight observed by us was 2.65 kg in study group and 2.86 kg in control group. Birth weight in study group was significantly lower than control group (p<0.05).

Incidence of low birth weight (birth weight <2.5kg) observed by us was 42% in study group while 22% in control group. This difference was found to be statistically highly significant (p<0.001) (Table 12). In study by Ghike et al, birth weight <2.5kg was in 51.35% in study group and 30.16% in control group which supports the results of present study.[4] In study by Jandial et al, low birth weight was found in 58% of cases which is almost similar to present study.[9] The high incidence of low birth weight in patients having reduced AFI are because of preterm birth, chronic placental insufficiency causing IUGR. Incidence of NICU admissions were observed 38% in study group as compared to 12% in control group and difference was statistically highly significant (p<0.001) (Table 13).

In study done by Bachhav et al NICU admission was 30% vs 9% in study and control group which is similar to present study.[18] Other studies done by Voxman et al, Gumus et al, Jandial et al were also found significant higher rate of NICU admission in patients with oligohydraminos.[9,10,19] NICU admission are more because of more incidence of preterm births, meconium aspiration, perinatal asphyxia in patients with less AFI. NICU admission is a direct predictor for perinatal morbidity. Thus, AFI in pregnancy can be used as a predictor of perinatal morbidity.

Perinatal deaths in our study was 10% in study group and 2% in control group. Among 10% perinatal deaths in

study group, 1% was IUD, 5% were still birth and 4% were early neonatal deaths. Perinatal death were significantly higher among study group ($p<0.05$) (Table 13). In the study by Jandial et al noted that perinatal death was 10% in patients with oligohydramnios and their results are similar to present study.[9] Similar results were found in study by Casey et al reported 6.4% perinatal death in their study, which was significantly high in patients with oligohydraminos.[7]

CONCLUSION

Oligohydramnios is associated with a high rate of pregnancy complications and increased perinatal morbidity and mortality. In presence of oligohydramnios, chances of induction, meconium stained liquor, development of fetal distress, LSCS, low 1 and 5 minute Apgar score, low birth weight and perinatal mortality are high.

AFI measurement in antepartum or intrapartum period can help to identify women who need increased antepartum surveillance for pregnancy complications and such women should be managed in a special unit to combat the complications effectively.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Brace RA, Wolf EJ. Normal amniotic fluid volume changes throughout pregnancy. Am J Obstet Gynecol. 1989;161:382-8.
2. Fernando A. Practical guide to high risk pregnancy and delivery. 2nd ed Mosby – year Book. Inc. 1993;30:150-59.
3. Phelan JP, Smith CV, Small M. Amniotic fluid volume assessment with four quadrant technique at 36-42 weeks of gestation. J Reprod Med. 1987;32:540-2.
4. Ghike S, Reddy G, Ghike NW. Increasing severity of oligohydramnios: A risk factor for outcome. J South Asian Feder Obst Gynecol. 2013;5(1):8-10.
5. Collen B, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. Am J Obstet Gynecol. 1995;173:167-74.
6. Garmel SH, Chelmow D, Sha SJ. Oligohydramnios and appropriately grown fetus. Am J Perinatol. 1997;14:359-63.
7. Casey BM, Mc-Intire DD, Donald D. Pregnancy outcome after diagnosis of oligohydramnios at or beyond 34 weeks of gestation. Am J Obstet Gynecol. 2000;182:902-12.
8. Rainford M, Adair R, Scialli AR, Ghidini A, Spong CY. Amniotic fluid index in the uncomplicated term pregnancy. Prediction of outcome. J Reprod Med. 2001;46(6):589-92.
9. Jandial C, Gupta S, Sharma S, Gupta M. Perinatal outcome after antepartum diagnosis of oligohydramnios at or Beyond 34 weeks of gestation. JK Sci. 2007;9(4):213-4.
10. Gumus II, Koktener A, Turhan NO. Perinatal outcomes of pregnancies with borderline amniotic fluid index. Arch Gynecol Obstet. 2007;276(1):17-9.
11. Crowley P, Harlihy CO, Boylan O. The value of ultrasound measurement of amniotic fluid volume in the management of prolonged pregnancies. Br J Obstet Gynecol. 1984;91:444-8.
12. Rutherford SE, 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. 197;70:353.
13. Ergün A, Atay V, Pabuçcu R, Başer I, Duru NK, Tokaç G. Predictive value of amniotic fluid volume measurements on perinatal outcome. Gynecol Obstet Invest. 1998;45(1):19-23.
14. Magann EF, Chouhan SP, Kinsella MJ. Antenatal testing among 1001 patients at high risk. The role of ultrasonographic estimate of amniotic fluid volume. Am J Obstet Gynecol. 1999;180:1330-6.
15. Sarno AP Jr, Ahn MO, Brar HS. Intrapartum Doppler velocimetry, amniotic fluid volume and fetal heart rae as prediction of subsequent fetal distress. Am J Obstet Gynecol. 1989;16:1508-14.
16. Conway DL, Adkins WB, Shroedere B. Isolated oligohydramnios in the term pregnancy: Is it a clinical entity? J Matern Fetal Med. 1998;7:197-200.
17. Sriya R, Singhai S. Perinatal outcome in patients with amniotic fluid index <5cm. J Obstet gynecol India. 2001;51(5):98-100.
18. Bachhav AA, Waikar MR. Low amniotic fluid index at term as a predictor of adverse perinatal outcome. J Evol Med Dent Sci. 2013;2(38):7221-6.
19. Voxman EG, Tran S, Wing DA. Low amniotic fluid index as a predictor of adverse perinatal outcome. J Perinatol. 2002;22(4):282-5.

Cite this article as: Chetani M, Deepika, Khajotia S, Kochar S. A Clinical study of amniotic fluid index at or beyond 28 weeks of gestation and its relation to perinatal outcome. Int J Reprod Contracept Obstet Gynecol 2017;6:3280-6.