International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Chauhan R et al. Int J Reprod Contracept Obstet Gynecol. 2019 Feb;8(2):665-671
www.ijrcog.org

pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20190302

Original Research Article

A study on fetal outcome in patients with oligohydramnios

Rooplekha Chauhan, Sonal Sahni*, Akanksha Dubey

Department of Obstetrics and Gynecology, N. S. C. B Medical College, Jabalpur, Madhya Pradesh, India

Received: 06 March 2018
Revision: 03 April 2018
Accepted: 28 July 2018

***Correspondence:**
Dr. Sonal Sahni,
E-mail: srajwarsahni@gmail.com

ABSTRACT

Background: There is an association between oligohydramnios and intrauterine growth restriction as well as increased perinatal mortality. Amniotic fluid provides a protected environment for the growing fetus, moderating the fetus against mechanical and biological injury. The objective of the present study was to study the fetal outcome in patients with oligohydramnios between 20 to 42 weeks of pregnancy.
Methods: Prospective study of 87 pregnancies with oligohydramnios was carried in Department of Obstetrics and Gynaecology, NSCB Medical College, Jabalpur from 1st March 2016 to 31stMarch 2017. All women enrolled for the study were subjected to history taking, clinical examination and amniotic fluid index estimation.
Results: Rate of caesarean section was higher in patients with oligohydramnios and higher number of neonates were admitted to the NICU amongst the patients of oligohydramnios.
Conclusions: Oligohydramnios has a significant correlation with adverse perinatal outcome.

Keywords: Amniotic fluid index (AFI), Maximum vertical pocket (MVP), Oligohydramnios

INTRODUCTION

Earth is known as the "Blue Planet" as nearly 70 percent of Earth's surface is covered with water. Interestingly,an average adult human body comprises 70 percent of water too. Taking clue from this law of nature, the fetus in utero is essentially surrounded by liquor amnii. The amniotic fluid is fundamental for adequate fetal development and growth of the fetus.

The assessment of amniotic fluid volume is crucial for predicting fetal well-being in uterus. The most common method for estimation of amniotic fluid volume is by ultrasonography. Oligohydramnios means reduced quantity of amniotic fluid. There is an association between oligohydramnios and intrauterine growth restriction as well as increased perinatal mortality. Normal amniotic fluid volume changes with gestational age and the methods of accurately estimating it have changed over the years. Oligohydramnios is defined as

- Maximum vertical pocket (MVP) of less than 2 cm from late mid-trimester.
- Amniotic fluid index (AFI) of less than 5 cm or less than the 5th percentile, from late mid-trimester.

Amniotic fluid provides a protected milieu for the growing fetus, cushioning the fetus against mechanical and biological injury, supplying nutrients and facilitating growth and movement. The quantity of amniotic fluid increases from 25 ml at 10 weeks to about 400ml at 20 weeks.[1] The composition of the amniotic fluid up to this period is identical to that of fetal plasma as there is free diffusion of the fluid to and from the fetus. The fetal skin then begins to keratinize, the process being completed by 25 weeks. Thereafter, the two major source of amniotic fluid are fetal urine and lung secretions. Removal of fluid

depends largely on fetal swallowing and intramembranous transport via the skin, placenta and cord surfaces. The volume increases to about 800-1000ml at 28 weeks plateaus at term and declines to about 400ml at 42 weeks. Oligohydramnios is associated with increased risk of adverse perinatal outcome which include:

- Abortion
- Meconium aspiration syndrome
- Fetal pulmonary hypoplasia
- Fetal deformity
- Cord compression
- Perinatal mortality.

Oligohydramnios is associated with increased rate of caesarean deliveries due to fetal distress, most commonly due to underlying cord compression.[2]

METHODS

This was a hospital based prospective observational study conducted in Department of Obstetrics and Gynaecology in N.S.C.B. Medical College, Jabalpur (M.P.). Period of study was between March 2016 to March 2017. In this study, 87 singleton pregnancies with gestation age between 20 to 42 weeks with AFI ≤5cm were analysed for perinatal outcome.

Inclusion criteria

- Pregnant women with gestational age of 20-42 weeks with amniotic fluid index 5cm or less.

Exclusion criteria

- Patients with premature rupture of amniotic membranes,
- Patient <20 weeks of gestation.
- Patients >42 weeks of gestation.
- Multiple gestation
- Treated cases of pregnant women with oligohydramnios between 20-42 weeks.

A written and informed consent was taken from each of the patient included in the study. This study was approved by Ethics Committee of Madhya Pradesh Medical Science University, Jabalpur (M.P.). History including age, parity, duration of gestation, menstrual history, obstetric history and history of any complications in present pregnancy was recorded. General clinical examination was performed. Obstetric examination included uterine size, presentation and adequacy of amniotic fluid clinically. Fetal heart rate was recorded. Per-speculum and per-vaginum examination were done to exclude rupture of the membranes. Appropriate investigations were done. An ultrasound examination was done for fetal well-being and amniotic fluid index was measured. Patients with AFI less than or equal to 5 were selected for the study. These patients were followed further for the mode of delivery and the condition of neonate was assessed by birth weight, APGAR score, color of liquor and the need for neonatal admission to NICU. All relevant information was recorded and analyzed by Chi-square test , Fishers exact test and Students t-test.

RESULTS

Out of 87 cases, 22 were booked and 65 cases were unbooked. Among booked cases,1 neonate died, whereas among unbooked cases 7 died, thus 12.50% neonatal deaths were among booked and 87.50 neonatal deaths were among unbooked cases. It was found to statistically insignificant in present study (Table 1). Table 1 highlights perinatal outcome according to booking status of mother. Out of total 22 booked cases, 1 neonate died and 21 survived.

Table 1: Perinatal outcome according to booking status of mother.

Booking status of mother	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
Booked	21	26.60	1	12.50
Un-booked	58	73.40	7	87.50

Table 2: Showing labour findings among women with oligohydramnios.

First stage of labour	Normal	% of normal	Abnormal (prolonged)	% of abnormal (prolonged)	Z value	P value
	80	91.9	7	80.1	11.07	<0.0001
Second Stage of labour (mode of delivery)	**Caesarean**	**% of Caesarean**	**Vaginal delivery**	**% of vaginal delivery**	**Z value**	**P value**
	44	50.5	43	49.5	0.15	0.88
Third stage of labour (separation of placenta)	**Active management**	**%**	**Spontaneous**	**%**	**Z value**	**P value**
	87	100	0	0	13.19	<0.0001
	2	2.3	85	97.7	12.58	<0.0001

Chi Square -0.76, P-value - 0.67

The total subjects were 87, Table 2 highlights that in patients with oligohydramnios 8.1% of subjects had prolonged first stage of labour. P Value < 0.0001. Hence significant. Selection criteria for length of various stages of first stage of labour, a latent phase that exceeds 20 hours in a primigravida or 14 hours in a multigravida is considered prolonged or abnormal. An active phase longer than 12 hours in a primigravida and longer than 6 hours in a multigravida was considered abnormal. Caesarean Section was done in 50.5% whereas 49.5% of subjects delivered vaginall. Out of 65 unbooked cases 58 survived and 7 died. Data is not statistically significant as p value is > 0.05. Oligohydramnios was more common in primi gravida (57.47%) (Table 2). Clinical judgement of liquor was done for all the patients who were diagnosed as oligohydramnios by USG. It was found to be adequate in 44 and inadequate in 43 patients. Out of all neonatal deaths (n=8) 87.50% was in the group which had inadequate liquor (Table 3).

Table 3: Perinatal outcome according to amount of liquor (clinical judgement).

Liquor clinically	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
Adequate	43	54.40	1	12.50
Not-adequate	36	45.60	7	87.50

Chi Square - 5.11, P value - 0.03

Table 3 highlights perinatal outcome according to clinical assessment of liquor (Per abdomen). Liquor was clinically found to be inadequate in 43 subjects. 7 out of 43 new born died. This data is statistically significant as P value is less than 0.05. Out of 87 subjects 43 were delivered vaginally and 44 underwent LSCS.

Table 4: Perinatal outcome according to mode of delivery.

Mode of delivery	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
Vaginal	36	45.50	7	87.50
LSCS	43	54.50	1	12.50

Chi Square - 6.91, P value - 0.03

Table 4 highlights perinatal outcome according to mode of delivery. Out of 87 subjects, 43 delivered vaginally and 44 underwent LSCS. Out of 43 delivered by vaginal route, 7 died and 36 survived. Only 1 out of 44 babies delivered by LSCS died. This value is statistically significant. Out of 43 deliveries by vaginal route 7 new born died and 37 survived, only 1 out of 44 new born delivered by C-section died. This value was statistically significant in present study. Rate of Cesarean-section was 50.5% in present study. 19 new born had APGAR <7 at 5 minutes in present study. This was statistically significant.

Table 5: Perinatal outcome according to admission of baby in NICU.

Admission of baby in NICU	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
No	60	75.90	6	75.00
Yes	19	24.10	2	25.00

Chi Square - 0.004, P value - 1.00

Table 5 is statistically non-significant. 21 new born out of 87 were admitted in the NICU. Reason for admission in NICU were prematurity, low birth weight, perinatal asphyxia, respiratory distress, neonatal jaundice, central cyanosis, apnoea, neonatal convulsion, shock, meconium aspiration. Major congenital anomaly was observed in 2 new-borns who died subsequently. Most patient with oligohydramnios were in the age group of 21 to 25 years.

Table 6: Perinatal outcome according to age distribution.

Age distribution	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
Upto 20 years	11	13.90	1	12.50
21-25 years	37	46.80	3	37.50
26-30 years	29	36.70	3	37.50
>30 years	2	2.50	1	12.50

T test - 0.93, P value - 0.36

Table 6 shows perinatal outcome according to age groups.

Table 7: Perinatal outcome according to parity of mother.

Parity	Perinatal outcome			
	Survived		Died	
	Count	Column%	Count	Column%
Primigravida	47	59.50	3	37.5
Multigravida	32	40.50	5	62.5

Table 8: Perinatal outcome according to APGAR-5.

Apgar-5	Perinatal outcome			
	Survived		Died	
	Count	Column	Count	Column
0	0	0.00	6	75.00
4	6	7.60	2	25.00
5	2	2.50	0	0.00
6	3	3.80	0	0.00
7	4	5.10	0	0.00
8	63	79.70	0	0.00
10	1	1.30	0	0.00

Chi Square - 69.04, P value - 0.001

Study depicts higher neonatal deaths in age group 21-25 and 26-30 which coincides with higher number of

patients in the same age group. Data is statistically insignificant.

Table 7 represents perinatal outcome according to parity of mother. Statistically non-significant. Mean gestational age for new born who survived was 37±2 weeks and for those who died was33±4 weeks. Mean weight of new born who survived was 2.38±0.42kg and for who died 1.37±0.58kg. Mean AFI for the new born who survived was 3.79±1.28 and those who died 2.56±1.50 cm. Table 8 highlights comparison of APGAR scores at 5 minute of birth of baby, among babies who died and survived. Low values of APGAR score was obtained among babies who died. Data is statistically significant.

Table 9: Perinatal outcome according to reason for admission of baby in NICU.

Reason for admission of baby in NICU		Perinatal outcome				Chi-square	P value
		Survived		Died			
		Count	Column%	Count	Column%		
Prematurity	No	75	94.90	6	75.00	4.50	0.01
	Yes	4	5.10	2	25.00		
Low birth weight	No	74	93.70	6	75.00	3.42	0.12
	Yes	5	6.30	2	25.00		
Perinatal Asphyxia	No	72	93.70	6	100.00	2.04	0.192
	Yes	7	6.30	2	0.00		
Neonatal Jaundice	No	75	94.90	8	100.00	0.42	1.0
	Yes	4	5.10	0	0.00		
Respiratory Distress	No	67	86.10	6	87.50	0.52	0.61
	Yes	12	13.90	2	12.50		
Large Baby	No	78	98.70	8	100.00	0.10	1.0
	Yes	1	1.30	0	0.00		
Refusal to accept Feed	No	77	97.50	7	87.50	2.17	0.25
	Yes	2	2.50	1	12.50		
Central Cyanosis	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Apnea	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Neonatal Convulsion	No	78	98.70	6	75.00	12.29	0.02
	Yes	1	1.30	2	25.00		
Diabetic Mother	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Oliguria	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Hypothermia	No	78	98.70	7	87.50	4.08	0.18
	Yes	1	1.30	1	12.50		
Hyperthermia	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Hypoglycemia	No	77	97.50	7	87.50	2.17	0.25
	Yes	2	2.50	1	12.50		
Shock	No	77	97.50	6	75.00	8.36	0.04
	Yes	2	2.50	2	25.00		
Meconium Aspiration	No	74	93.70	8	100.00	0.54	1.0
	Yes	5	6.30	0	0.00		
Bleeding	No	78	98.70	8	100.00	0.10	1.0
	Yes	1	1.30	0	0.00		
Diarrhea	No	79	100.00	8	100.00	-	-
	Yes	0	0.00	0	0.00		
Major congenital malformation	No	79	100.00	6	75.00	20.21	0.001
	Yes	0	0.00	2	25.00		

Chi Square for Prematurity - 4.50, P Value - 0.001, Chi Square for Neonatal- 12.29, P Value - 0.002, Chi Square for Major congenital malformation- 20.21, P Value - 0.007, P value less than 0.05. Statistically significant.

Table 10: Mean of variables.

	Perinatal outcome				T test	P value
	Survived		Died			
	Mean	Standard deviation	Mean	Standard deviation		
Gestational age (in weeks)	37	2	33	4	4.27	<0.001
Gestational age by USG (in weeks)	34	3	30	4	4.27	<0.0001
AFI (in cm)	3.79	1.28	2.56	1.51	2.54	0.01
Baby weight (in kg)	2.38	0.42	1.39	0.58	6.09	<0.0001

- Mean gestational age for babies who survived-37 weeks and for babies who died 33 weeks
    - T Test value-4.36
    - P value <0.001
    - Statistically significant.
- Mean value for gestational age by USG for babies who survived-34 weeks and died 30 weeks
    - T test-4.27
    - P value <0.001
    - Statistically significant
- Mean value of AFI for babies who survived-3.79cm and died-2.56cm
    - T test-2.54
    - P value-0.01
    - Statistically significant
- Mean value of baby weight for babies who survived-2.38kg and for babies who died-1.39kg
    - T test-6.09
    - P value <0.0001
    - Statistically significant

DISCUSSION

In present study maximum number of women who had oligohydramnios (n=37) belonged to age of 21-25 years (46%). Similar observation was made by a study done by Jayati Nath et al in Medical College and Research centre Moradabad (UP) in a study entitled.[3] A clinical study on oligohydramnios in third trimester of pregnancy with special emphasis on perinatal outcome.

In their study, 46.15 % women belonged to age group of 21 to 25 years. Studies done by Casey at el, Chauhan et al, Magnan et al found there is no significant relation of age with oligohydramnios.[4-6] In another study by Nazlima N et al 7 in a private hospital at Dhaka 46% women belonged to age group of 21-25 years.[7]

Mean age

Mean age of women whose newborn survived was 25 years and those whose newborn died was 26 years (with a standard deviation of 4 years. Similar study by Chauhan et al 5, Jun. Zhang et al, Everett et al and Vidyadhar B Bangal et al found that mean maternal age were 23.6±6.5 years, 28.4±6.4 years and 23.8±5.7 year and 22.8±4.2 years respectively.[5,8-10]

Parity

Most of the primigravida (n=23) had PIH and consequently oligohydramnios. The incidence of oligohydramnios in primigravida in present study was 59.50%. Similar result was obtained in a study done by Modi JY et al where it was 52%.Jagatia et al 12 also reported that incidence of oligohydramnios was more in primigravida (52.0%) which is compatible with Petrozella et al and Jandial et al who showed that incidence of oligohydramnios was 60.0% in primigravida.[11,13,14]

Influence of antenatal care

In present study oligohydramnios was more common in unbooked cases. (66.66 %). Death of neonates was 12% in unbooked cases as compared with 4% in booked cases. In a study called Clinical study of oligohydramnios, mode of delivery and perinatal outcome , conducted by Kondepagu Madhavi et al at Guntur Government Medical College it was shown that low AFI is marginally more common in unbooked cases compared to booked cases indicating that a proper antenatal care reduces the number of cases with oligohydramnios.[15]

Mode of delivery

In present study caesarean section was done in 50.5 % of subjects. 49.5 % of subjects were delivered by vaginal route. 7 out of 8 neonatal deaths occurred in subjects, delivered vaginally and only 1 death occurred among babies delivered by LSCS. Percentage of caesarean section in different studies done by Chandra P et al, Casey et al, Sriya et al, Umber et al, Vasvalingam G et al Chate P et al were 76.9 % ,51%, 43.05 % ,32%, and 75.6% , 64% respectively.[4,16-20] Ahmad and Munin noted a more than 2-fold higher caesarian section rate in oligohydramnios (42%). For avoidance of adverse effects on perinatal outcome in most cases caesarian section was done.[21] The higher caesarean rate in present study could be to avoid fetal complication like cord compression, patient's desire and associated co-morbidities like PIH.

Apgar Score

In present study 26.4% babies had low APGAR score i.e. < 7 in 1-5 minutes . Similar results were found in studies

by Nazlima et al who noted an APGAR score of < 7 at 5 min in 26.9% and Jayati Nath et al who reported APGAR score < 7 at 5 min in 26 %.[3,7]

Amount of liquor (clinical judgement)

45.6% of our cases were clinically found to have inadequate liquor, although by ultrasound criteria all cases included had AFI less than or equal to 5. Out of clinically diagnosed oligohydramnios subjects , 19.4 % was the perinatal death rate as compared to 2% for adequate liquor. This was found be statistically significant in present study.

Admission in NICU

In present study there were 21 of 87 admissions in NICU i.e. 24%.This is consistent with the study of Johnson et al, who found 20% of neonates had NICU admission.[22] Also agrees with Krishna Jagatia et al who also found 20% of neonates had NICU admission.[12] Grammel et al, Jandial et al noticed that the rate of NICU admission was found to be 16% and 18% respectively.[14,23] In present study 24 % babies were shifted to NICU for various complaints such as prematurity, low birth weight, perinatal asphyxia, neonatal jaundice, respiratory distress, refusal to accept feed, central cyanosis, apnea, neonatal convulsion, oliguria, hyperthermia hypothermia, hypoglycemia, shock, meconium aspiration, bleeding, major congenital malformation. Prematurity was present in 4 and this lead to 50% mortality as 2 of them died. Occurrence of convulsions was the reason for admission of 3 babies in NICU. Mortality because of convulsion was 66.66% as 2 out of 3 babies died.

Congenital anomaly

Congenital anomaly of serious nature was present in 2 babies (first case with gross fetal ascites , asymmetrical hydrocephalous with occipital encephalocele and another one with gross fetal ascites with meningomyelocele). There was 100% mortality of babies with gross congenital anomalies in present study. The incidence of congenital anomaly was 6% in present study and 8.5% in study by Guin et al 24 in oligohydramnios group.

Mean birth weight

Birth weight has a direct impact on survival rate . In present study mean birth weight was 2.38 ± 0. 42 kg among babies who survived and 1.39 ± 0.58 kg among babies who died. The mean birth weight was 2.4 kg in study by Kondepagu et al.[15] Low birth weight (less than 2500 gm.) was present in 65% in the study conducted by Nazlima et al.[7]

Mean of amniotic fluid index

Marked oligohydramnios was associated with higher neonatal mortality. Mean AFI in subjects whose babies survived was 3.77 ± 0.72 cm and those whose babies died was 1.32 ± 0.58 cm. Mean AFI in study by Bangal VB et al10 3.00 ± 1.04 cm . Sadovsky Y et al in their study found mean amniotic fluid index was 2.9 cm.[25]

Mean gestational age

Mean gestational age was found to be 37 ± 3 weeks in subjects whose babies survived and 30±4 weeks in subjects whose newborn died . In a study by Bangal et al10 , 36.72 ± 4.11 week was found to be mean gestational age. In a study by Amany Hamed Gad Mohamed.et al mean weeks of gestation was 38.9 ± 1.3 weeks.[26] In other study by Ghike et al mean gestational age was reported as 40.30 ± 1.0 week.[27] A possible explanation of above finding might be related to the fact that oligohydramnios with fetal distress which requires an early interference through induction of labor.

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

REFERENCES

1. Bhat S. Study of effect of oligohydramnios on maternal and fetal outcome. Int J Med Dental Sci. 2015;4(1):582-8.
2. Nazlima N, Fatima B. Oligohydramnios at third trimester and perinatal outcome. Bang J Med Sci. 2012;11(1):33-6.
3. Nath J, Jain M, Najam R. A clinical study on oligohydramnios in the third trimester of pregnancy with special emphasis on the perinatal outcome. J Evol Med Dent Sci. 2013;2(39):7386-91.
4. Casey BM, McIntire DD, Bloom SL, Lucas MJ, Santos R, Twickler DM, et al. Pregnancy outcomes after antepartum diagnosis of oligohydramnios at or beyond 34 weeks' gestation. Am J Obstet Gynecol. 2000;182(4):909-12.
5. Chauhan SP, Doherty DD, Magann EF, Cahanding F, Moreno F, Klausen JH. Amniotic fluid index vs single deepest pocket technique during modified biophysical profile: a randomized clinical trial. Am J Obstet Gynecol. 2004;191(2):661-7.
6. Magann EF, Chauhan SP, Doherty DA, Magann MI, Morrison JC. The evidence for abandoning the amniotic fluid index in favor of the single deepest pocket. Am J Perinatol 2007; 24(09):549-55.
7. Nazlima N, Fatima B (2012): Oligohydramnios at third trimester and perinatal outcome; Bang J Med Sci. Obstet Gynecol. 2004;269(1):130-3.
8. Jun Zhang, James Troendle: Isolated oligohydramnios is not associated with adverse perinatal outcome. Int J Gynaecol Obstet. 2004;111(3):220-5.
9. Everett FM, Thomas EN: Measurement of amniotic fluid volume- Accuracy of ultrasonography

technique. Am J Obstet Gynecol 1992; 167(6):1533-7.
10. Bangal VB, Giri PA, Sali BM. Incidence of oligohydramnios during pregnancy and its effects on maternal and perinatal outcome. J Pharmaceut Biomed Sci (JPBMS). 2011;12(5):1-4.
11. Modi JY, Patel RV, Shah PT, Agrawal AG. Fetomaternal outcome in pregnancy with oligohydramnios. Int J Reprod Contracept Obstet Gynecol. 2016;5(11):4037-40.
12. Krishna Jagatia et al. Maternal and fetal outcome in oligohydramnios : a study of 100 cases. Int J Med Sci Public Health. 2013;2(3):724-7.
13. Petrozella LN, Dashe JS, McIntire DD, Le veno KJ. Clinical Significance of Borderline Amniotic Fluid Index and Oligohydramnios in Preterm Pregnancy. Obstet Gynecol. 2011;117(2 Pt 1):338.
14. Jandial C, Gupta S, Sharma S, Gupta M. Peri natal Outcome After Antepartum Diagnosis of Oligohydramnios at or Beyond 34 Weeks of Gestation. JK Sci 2007;9(4):213.
15. Madhavi K, Rao PC. Clinical Study of oligohydramnios, mode of delivery and perinatal outcome. IOSR Journal of Dental and Medical Sciences. 2015;14(4):6-11.
16. Chandra PC, Schiavello HJ, Lewandowski MA. Effect or oral and intra venous hydration on oligohydramnios. J Repord Med. 2000;45(4):337-40.
17. Sriya R, Singhai S, Perinatal outcome in patients with amniotic fluid index < 5cm. J Obstet Gynaecol India 2001;51:98-100.
18. Umber A. Perinatal Outcome in Pregnancies Complicated by Isolated Oligohydramnios at Term. Annals of King Edward Medical University. 2009;15:35-7 .
19. Visvalingam G, Purandare N, Cooley S, Roopnarinesingh R, Geary M. Perinatal outcome after ultrasound diagnosis of anhydramnios at term. J Obstet Gynaecol 2012;32(1):50-3.
20. Preshit Chate, Meena Khatri, C. Hariharan. Pregnancy outcome after diagnosis of oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2013;2(1):23-6.
21. Ahmad, H., Munim, S. (2009). Isolated oligohydramnios is not an indicator for adverse perinatal outcome. J Pak Med Associat. 2009;59(10):691-4.
22. Johnson JM, Chauhan SP, Ennen CS, Niederhauser A, Magann EF. A comparison of 3 criteria of oligohydramnios in identifying peripartum complications: a secondary analysis. Am J Obstet Gynecol. 2007;197(2):207-e1.
23. Garmel SH, Chelmow D Sha et al. Oligohydramnios and appropriately grown fetus. Am J Perinatol 1997; 14(6):359-63.
24. Guin G, Punekar S, Lele A, Khare S. A prospective clinical study of fetomaternal outcome in pregnancies with abnormal liquor volume. J Obstet Gynaecol India. 2011;61(6):652-5.
25. Sadovsky Y, Christensen MW: Cord containing amniotic fluid pocket-a useful measurement in the management of oligohydramnios. Obstet Gynecol. 1992; 80 (5):775-7.
26. Mohamed AH. Pregnancy Outcome among Patients with Oligohydramnios and Suggested Plan of Action. IOSR J Nursing Health Sci.2015;4(5):65-75.
27. Ghike Sunita, Gayathri Reddy, NW Ghike. Increasing Severity of Oligohydramnios: A Risk Factor for Outcome. J South Asian Fed Obstet Gynaecol. 2013;5(1):8-10.

Cite this article as: Chauhan R, Sahni S, Dubey A. A study on fetal outcome in patients with oligohydramnios. Int J Reprod Contracept Obstet Gynecol 2019;8:665-71.