Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/hpfq5v13

ADVERSE PREGNANCY OUTCOMES IN OLIGOHYDRAMNIOS MEASURE BY AMNIOTIC FLUID

Dr. Khansa Fazil Qazi[1*], Dr. Sabaeena Wali[2], Dr. Lailma Tariq[3], Dr. Amna Begum[4], Dr. Naeema Bibi[5], Dr. Mujeeb Ur Rehman Sahito[6]

[1*,2]FCPS (Obstetrics & Gynaecology), Consultant Gynaecologist and Obstetrician, DHQ Hospital, Nowshera Pakistan
[3]MBBS, FCPS (Gynae & Obs), Senior Registrar, Gynae and Obstetrics Unit, Mohammad Teaching Hospital, Peshawar Pakistan
[4]MBBS, FCPS, MCPS, Assistant Professor, Department of Obstetrics and Gynecology, Karachi Medical & Dental College/Abbasi Shaheed Hospital, Karachi Pakistan
[5]FCPS (Obstetrics & Gynaecology), Consultant Gynaecologist and Obstetrician, DHQ Hospital, Nowshera Pakistan
[6]MBBS, MS General Surgery, MS Urology, Department of Anatomy, Peoples University of Medical and Health Sciences for Women, Nawabshah SBA Pakistan

***Corresponding author:** Dr. Khansa Fazil Qazi
*Consultant Gynaecologist and Obstetrician, DHQ Hospital Nowshera. Email : fhareem044@gmail.com

ABSTRACT

Background: Pregnancy is the time period between conception and delivery of the baby. Normal period ranges from 37 weeks to 42 weeks. Adverse pregnancy outcome includes adverse event, more especially, to infant like infant mortality/morbidity, stillbirth and low birth weight.

Objective: To determine the frequencies of adverse pregnancy events in oligohydramnios patients in pregnant women

Material and Methods: This descriptive study was carried out in the Department of Gynecology, Lady Reading Hospital, Peshawar in collaboration with technical help of Karachi Metropolitan University for six months from 15th August 2020 to 15th February 2021. In the present study all patient coming for antenatal assessment having Oligohydramnios in age 18 to 40 years, single gestation, parity = 0 to 5, gravida= 1 to 5, gestational age= third trimester were included, each patient was send for assessment of Oligohydramnios by AFI. In all patient's demographic data was taken. Ultrasound was done for AFI by an experienced radiologist of at least 3-year post-graduation training. The data was noted in the questionnaire. At the time of delivery or any other emergency the parameter of adverse pregnancy outcomes (mentioned in operational definition) was assessed and was noted in the proforma. The patients were discussed with senior if any treatment is possible the treatment if given any was also noted in proforma.

Results: Our study shows that among 123 patients mean age was 31 years with standard deviation± 9.91. Mean POG was 38 weeks with standard deviation± 4.12. 73(59%) women had adverse pregnancy outcomes in which 22(30%) women had delivery by cesarean section, 11(15%) women had fetal distress, 6(8%) women had still birth, 8(11%) women had meconium in amniotic fluid, 13(18%) neonates were admitted to neonatal ICU, 13(18%) neonates had Apgar score <7 at 5 mint.

Conclusion: Our study concludes that frequencies of adverse pregnancy events was 59% in which delivery by cesarean section was 30%, fetal distress was 15%, still birth was 8%, meconium in amniotic fluid was 11%, admission to neonatal ICU was 18% and Apgar score <7 at 5 was 18% in patients presenting with oligohydramnios

Keywords: Adverse pregnancy events, oligohydramnios,

INTRODUCTION

Pregnancy is the time period between conception and delivery of the baby. Normal period ranges from 37 weeks to 42 weeks. Adverse pregnancy outcome includes adverse event, more especially, to infant like infant mortality/morbidity, stillbirth and low birth weight. The time around delivery and the postnatal period is the most vulnerable for both mother and newborn. Annually there are over 2.5 million stillbirths[1] occur around the world[11]. In developed country this rate in low. In Latin America the still birth and perinatal mortality is 17.2 and 30.4 per thousand respectivley[2]. In developing country this is very high. In India the adverse pregnancy outcome is high with 28.2% low birth weight and 54.2% intrauterine growth restriction[33]. In Africa there are 21.2 per thousand still birth and 34.4 per thousand perinatal mortality[22]. These value are 25.6 and 44.3 in India, 56.5 and 95.2 in Pakistan respectively (each per 1,000)[2]. The stillbirth, neonatal mortality and perinatal mortality rates in Pakistan were more than twice that of the many other countries[2].

Over the last 25 years there have been a significant improvement in maternal and newborn outcomes in many countries[4]. But in Pakistan the situation almost remains the same. The Pakistan Demographic and Health Survey (PDHS) 2012-13 reports a perinatal mortality rate of 75 per 1000 pregnancies[5]. Which is almost similar to the its report in 19901991[66]. Also, a more recent report on early neonatal mortality and stillbirth estimates that a child delivered in Pakistan has the highest risk in the world of both intrapartum stillbirth and death on the day of birth[7]. By comparison to its neighbors and other developing countries with a similar economic development, Pakistan has had achieved limited success in reducing maternal and newborn deaths[7].

All these adverse events further increase in oligohydramnios. It has been shown that there is strong association between oligohydramnios and birthweight<10th centile[89]. Rates of cesarean delivery for non-reassuring fetal testing (8.2% vs. 3.9%, $p<0.001$) and of neonates with birth weight <10th percentile (13.2% vs. 5.5%, $p<0.001$) were significantly higher in the AFI ≤5 cm group compared with the AFI >5 cmespecially in the last weeks of pregnancy[9].

Previously Amniotic fluid index was used for the diagnosis of Oligohydramnios and in turn adverse pregnancy outcome predication, as shown by a study that an antepartum amniotic fluid index (AFI) of ≤5.0 cm, in comparison with >5.0 cm, is associated with an increased occurrence of cesarean delivery for fetal distress and an Apgar score of <7 at 5 minutes[10].

There should be a proper investigation antenatal to decrease the adverse pregnancy outcomes in a country of high prevalence of pregnancy adverse outcome like Pakistan[5,7].

The rationale of my study is to study the diagnostic prediction of AFI, on Pakistani population to decrease the high prevalent adverse pregnancy outcomes in Pakistan[2,5,6,] especially in Lady Reading Hospital as no study is present in last 5 years. The result of this study can be used for the timely prediction of the any adverse event to fetus and hence will decrease the economic burden by unnecessary cesarean sections and also morbidity and mortality of both. This study will give us strengthen our knowledge about these tests predictions.

MATERIAL AND METHODS

This descriptive study was conducted at the Department of Gynecology, Lady Reading Hospital, Peshawar in collaboration with technical help of Karachi Metropolitan University, over six months from 15th August 2020 to 15th February 2021. The sample size was calculated based on a 13.2% prevalence of low birth weight in oligohydramnios patients, with a 6% margin of error and a 95% confidence interval, resulting in a sample size of 123. Non-probability consecutive sampling was used. Inclusion criteria included patients aged 18 to 40 years, diagnosed with oligohydramnios,

having a single gestation, parity between 0 to 5, gravida between 1 to 5, and in their third trimester, who agreed to provide consent and relevant information. Exclusion criteria included multiple gestations, unwillingness to consent, congenital fetal malformations, and patients either too old (over 60) or too young (under 18).

Data Collection Procedure:
After approval of synopsis, permission from the ethical committee of the hospital and research department of CPSP to conduct the study was taken. Each participant was including in the study according to exclusion and inclusion criteria mentioned above. Informed consent (Annexure 2) was obtained from the participants before the start of study. Before informed consent, the purpose and benefits of the study was explained and confidentiality was maintained. Each patient was send for assessment of Oligohydramnios by AFI. In all patient's demographic data was taken. Ultrasound was done for AFI by an experienced radiologist of at least 3-year post-graduation training. The data was noted in the questionnaire. At the time of delivery or any other emergency the parameter of adverse pregnancy outcomes (mentioned in operational definition) was assessed and was noted in the proforma. The patients were discussed with senior if any treatment is possible the treatment if given any was also noted in proforma. All the Data was collected by researcher herself and recorded on especially designed Performa.

Data Analysis:
Data was analyzed with statistical analysis program (IBMSPSS.Version.23). Frequency and percentage were computed for each outcome like still birth, birth asphyxia, admission to ICU. Mean ±SD were presented for age, gestational age, number of gravida/ parity, Amniotic fluid index (AFI). Effect modifiers like age, gestation age, parity were controlled through stratification. Post stratification chi square test was applied by taking p-value ≤0. 05 as significant.

RESULTS
The study comprised 123 participants, predominantly aged between 18-30 years (75 participants, 61%), with the remaining 48 participants (39%) aged 31-40 years. The mean age was 33 years (± 9.91). The period of gestation (POG) for most participants ranged between 37-39 weeks (81 participants, 66%), while 42 participants (34%) had a POG of 39-42 weeks, with a mean POG of 38 weeks (± 4.12). In terms of parity, 65 participants (53%) were primipara, and 58 (47%) were multipara. Regarding gravidity, 69 participants (56%) were primigravida, and 54 (44%) were multigravida. The amniotic fluid index (AFI) was ≤ 3 cm in 36 participants (29%) and >3 cm in 87 participants (71%), with a mean AFI of 3 (± 2.02). Adverse pregnancy outcomes were observed in 73 participants (59%), with 22 (30%) having a cesarean delivery, 11 (15%) experiencing fetal distress, 6 (8%) resulting in stillbirth, and 8 (11%) showing the presence of meconium in the amniotic fluid. **Table 1**
In the present study, Delivery by cesarean section occurred in 22 patients (17.9%), with 13 (10.6%) in the 18-30 years' age group and 9 (7.3%) in the 31-40 years age group (p=0.8414), showing an insignificant difference. Fetal distress was observed in 11 patients (8.9%), with 7 (5.7%) in the 18-30 years' group and 4 (3.3%) in the 31-40 years group (p=0.8496), also insignificant. Stillbirth occurred in 6 patients (4.9%), with 4 (3.3%) in the younger age group and 2 (1.6%) in the older age group (p=0.7695), showing no significant difference. The presence of meconium in amniotic fluid was noted in 8 patients (6.5%), with 5 (4.1%) in the younger group and 3 (2.4%) in the older group (p=0.9271), which was insignificant. NICU admissions were required for 13 newborns (10.6%), with 8 (6.5%) in the younger group and 5 (4.1%) in the older group (p=0.9649), also insignificant. Lastly, an Apgar score of less than 7 at 5 minutes was recorded in 13 cases (10.6%), with 8 (6.5%) in the 18-30 years' group and 5 (4.1%) in the 31-40 years' group (p=0.9649), showing no significant difference. Overall, there were no significant differences in adverse pregnancy outcomes between the two age groups. **Table 2**

In this study of 123 patients, adverse pregnancy outcomes were analyzed based on gestational age groups of 37-39 weeks and 39-42 weeks. Delivery by cesarean section occurred in 22 patients (17.9%), with 15 cases (12.2%) in the 37-39 weeks group and 7 cases (5.7%) in the 39-42 weeks group, showing no significant difference (p=0.7993). Fetal distress was observed in 11 patients (8.9%), with 7 cases (5.7%) in the 37-39 weeks group and 4 cases (3.3%) in the 39-42 weeks group, also showing no significant difference (p=0.8708). Stillbirth occurred in 6 patients (4.9%), with 4 cases (3.3%) in the 37-39 weeks group and 2 cases (1.6%) in the 39-42 weeks group, which was not significant (p=0.9656). Meconium in amniotic fluid was present in 8 patients (6.5%), with 5 cases (4.1%) in the 37-39 weeks group and 3 cases (2.4%) in the 39-42 weeks group, showing no significant difference (p=0.8361). NICU admissions were required for 13 patients (10.6%), with 9 cases (7.3%) in the 37-39 weeks group and 4 cases (3.3%) in the 39-42 weeks group, which was not significant (p=0.7859). Finally, an Apgar score at 5 minutes less than 7 was noted in 13 patients (10.6%), with 9 cases (7.3%) in the 37-39 weeks group and 4 cases (3.3%) in the 39-42 weeks group, also showing no significant difference (p=0.7859). Thus, the comparison of adverse outcomes between the two gestational age groups revealed no significant differences. **Table 3**

In this study of 123 patients, the stratification of adverse pregnancy outcomes based on parity showed varying results. Delivery by cesarean section occurred in 22 patients (17.9%), with 12 (9.8%) being primiparous and 10 (8.1%) multiparous (p = 0.8600, insignificant). Fetal distress was observed in 11 patients (8.9%), with 6 (4.9%) primiparous and 5 (4.1%) multiparous (p = 0.9057, insignificant). Stillbirth occurred in 6 patients (4.9%), equally distributed between primiparous (2.4%) and multiparous (2.4%) (p = 0.8861, insignificant). The presence of meconium in amniotic fluid was noted in 8 patients (6.5%), with 4 (3.3%) primiparous and 4 (3.3%) multiparous (p = 0.8675, insignificant). NICU admissions were required for 13 newborns (10.6%), including 7 (5.7%) from primiparous and 6 (4.9%) from multiparous mothers (p = 0.9390, insignificant). Lastly, an Apgar score at 5 minutes less than 7 was recorded in 13 newborns (10.6%), with 7 (5.7%) from primiparous and 6 (4.9%) from multiparous deliveries (p = 0.9390, insignificant). All p-values indicate no significant difference in adverse outcomes between primiparous and multiparous groups. **Table 4**

Table 1: Age distribution, status of period of gestation, status of parity, status of gravidity, status of amniotic fluid index, status of adverse pregnancy outcomes and common adverse pregnancy outcomes (n=123)

Age	**Frequency**	**Percentage**
18-30 years	75	61%
31-40 years	48	39%
Mean age was 33 years with standard deviation ± 9.91		
POG		
37-39 weeks	81	66%
39-42 weeks	42	34%
Mean POG was 38 weeks with standard deviation ± 4.12		
Parity		
Primi para	65	53%
Multi Para	58	47%
Gravidity		

Primi gravida	69	56%
Multi gravida	54	44%
AFI		
≤ 3 cm	36	29%
>3 cm	87	71%
Mean AFI was 3 with standard deviation ± 2.02		
Adverse Pregnancy Outcomes		
Yes	73	59%
No	50	41%
Adverse Pregnancy Outcomes (n=73)		
Delivery by cesarean section	22	30%
Fetal distress	11	15%
Still birth	6	8%
Presence of meconium in amniotic fluid	8	11%

Table No 2: Distribution of patients according to adverse Pregnancy Outcomes with Age in groups (n = 123)

ADVERSE PREGNANCY OUTCOMES		**18-30 years**	**31-40 years**	**Total**	**P value**
Delivery by cesarean section	Yes	13	9	22	0.8414
	No	62	39	101	
Total		75	48	123	
Fetal distress	Yes	7	4	11	0.8496
	No	68	44	112	
Total		75	48	123	
Still birth	Yes	4	2	6	0.7695
	No	71	46	117	
Total		75	48	123	
Presence of meconium in amniotic fluid	Yes	5	3	8	0.9271
	No	70	45	115	
Total		75	48	123	
NICU Admissions	Yes	8	5	13	0.9649
	No	67	43	110	
Total		75	48	123	
Apgar score at 5 mint <7	Yes	8	5	13	0.9649
	No	67	43	110	
		75	48	123	

Table No 3: Distribution of patients according to adverse Pregnancy Outcomes with gestational age (n = 123)

ADVERSE PREGNANCY OUTCOMES		37-39 weeks	39-42 weeks	Total	P value
Delivery by cesarean section	Yes	15	7	22	0.7993
	No	66	35	101	
Total		81	42	123	
Fetal distress	Yes	7	4	11	0.8708
	No	74	38	112	
Total		81	42	123	
Still birth	Yes	4	2	6	0.9656
	No	77	40	117	
Total		81	42	123	
Presence of meconium in amniotic fluid	Yes	5	3	8	0.8361
	No	76	39	115	
Total		81	42	123	
NICU Admissions	Yes	9	4	13	0.7859
	No	72	38	110	
Total		81	42	123	
Apgar score at 5 mint <7	Yes	9	4	13	0.7859
	No	72	38	110	
Total		81	42	123	

Table No 4: Stratification of Adverse Pregnancy Outcomes with Parity (n = 123)

ADVERSE PREGNANCY OUTCOMES		Primi para	Multi Para	Total	P value
Delivery by cesarean section	Yes	12	10	22	0.8600
	No	53	48	101	
Total		65	58	123	
Fetal distress	Yes	6	5	11	0.9057
	No	59	53	112	
Total		65	58	123	
Still birth	Yes	3	3	6	0.8861
	No	62	55	117	
Total		65	58	123	
Presence of meconium in amniotic fluid	Yes	4	4	8	0.8675
	No	61	54	115	
Total		65	58	123	
NICU Admissions	Yes	7	6	13	0.9390
	No	58	52	110	
Total		65	58	123	
Apgar score at 5 mint <7	Yes	7	6	13	0.9390
	No	58	52	110	
Total		65	58	123	

DISCUSSION

Pregnancy is the time period between conception and delivery of the baby. Normal period ranges from 37 weeks to 42 weeks. Adverse pregnancy outcome includes adverse event, more especially, to infant like infant mortality/morbidity, stillbirth and low birth weight. The time around delivery and the postnatal period is the most vulnerable for both mother and newborn. Annually there are over 2.5 million stillbirths[1] occur around the world[1]. In developed country this rate in low. In Latin America the still birth and perinatal mortality is 17.2 and 30.4 per thousand respectively [2]. In developing country this is very high. In India the adverse pregnancy outcome is high with 28.2% low birth weight and 54.2% intrauterine growth restriction[3]. In Africa there are 21.2 per thousand still birth and 34.4 per thousand perinatal mortality[2]. These value are 25.6 and 44.3 in India, 56.5 and 95.2 in Pakistan respectively (each per 1,000)[2].

Our study shows that among 123 patients mean age was 31 years with standard deviation± 9.91. Mean POG was 38 weeks with standard deviation± 4.12. 73(59%) women had adverse pregnancy outcomes in which 22(30%) women had delivery by cesarean section, 11(15%) women had fetal distress, 6(8%) women had still birth, 8(11%) women had meconium in amniotic fluid, 13(18%) neonates were admitted to neonatal ICU, 13(18%) neonates had Apgar score <7 at 5 mint.

Our results correlates with another study conducted by Nath J et al[11] in which adverse pregnancy outcomes was reported in 52% cases in which 33% patients had delivery by cesarean section, 18% patients had fetal distress, 7% patients had still birth, 10.2% patients had meconium in amniotic fluid, 34.61% patients had admission to neonatal ICU, 35% neonates had APGAR score of less than 7 at 5 minutes in 34.61%, birth asphyxia in 15.38%.

In another study carried out by Modi JY et al[12] had reported that adverse pregnancy outcomes was found in 47% cases in which 29% women had cesarean section, 16% women had fetal distress, 10% women had still birth, 15% neonates had Apgar score < 7 at 5 mint, NICU admissions in 22%, low birth weight was 56%, meconium aspiration syndrome was observed in 18%, birth asphyxia 20% of babies born to women with oligohydramnios.

In another study carried out by Syria R et al[13] in their study have reported the frequency of cesarean section was 33%, fetal distress was 17%, still birth 9%, meconium in amniotic fluid was 8% and 19% incidence of Apgar score less than 7 at 5 minute.

Similar findings were observed in another study done by Casey B et al[14] in which cesarean section was 30%, fetal distress was 12%, still birth 6%, meconium in amniotic fluid was 6% and 6% babies had Apgar score of less than 3 at 5 minute.

Out of these nine babies, seven died during neonatal period. In another study conducted by Jun Zhang et al[15] had reported that an Apgar score of <7 at 1 minute was present in fifteen. Six babies had Apgar score of <7 at 5 minute. The incidence of meconium aspiration syndrome in infants with oligohydramnios was significantly higher despite the diminished identification of meconium stained amniotic fluid. Bowen Chattoor JS et al[16] studied perinatal outcome in 55 postdate pregnancies. Oligohydramnios was noted in four patients.[16] All 4 babies were admitted with meconium aspiration. One died due to this complication.

Syria R et al[13] has reported a very high incidence of NICU admission. In their study 88.88% newborns were admitted in NICU in patients having AFI< 5cm, low birth weight was 65%, small for gestational age was 15%, meconium aspiration syndrome was 22%, birth asphyxia was 24%, Casey BM et al(Casey et al. 2000[3])in their study have reported 7% admission to the NICU in patients with AFI <5cm. Browen CJS et al en-Chatoor & Kulkarni 1995) in their study have reported 29.4% admission to NICU in patients with AFI <5cm.

In another study conducted by Ghosh R et al[17] had reported that 65.5% participants were belonged to 20 to 25 age group and 35.5% participants were Primigravida. Mean age was 23.9±3.3 years and mean gestation age was 36.9 week. Almost 72.2% were in 34 to 37 weeks of gestational age. Study found FMC <10 in 56.4% of participants. Forty percent participants have AFI 4 and 27.3% have AFI 5. 47.3% delivery was done by vaginal route. 5.5% baby was still birth and prematurity were the most common cause of still birth. Around 71% babies were low birth weight

and congenital anomalies were present in 7.3% babies. APGAR score measured <7 at 1 minute was in 65.4% and <7 at 5 minutes was in 43.6% babies.

In another study carried out by Jagatia K et al[17] had reported that the common fetal outcome in women presenting with oligohydramnios at term were low birth weight 60%, small for gestational age 17%, meconium aspiration syndrome 23%, birth asphyxia 25%, NICU admissions was 38%.

Conflict of interest

There is no conflict of interest

CONCLUSION

Our study concludes that frequencies of adverse pregnancy events was 59% in which delivery by cesarean section was 30%, fetal distress was 15%, still birth was 8%, meconium in amniotic fluid was 11%, admission to neonatal ICU was 18% and Apgar score <7 at 5 was 18% in patients presenting with oligohydramnios

REFERENCES

1. Cousens S, Blencowe H, Stanton C, Chou D, Ahmed S, Steinhardt L, et al. National, regional, and worldwide estimates of stillbirth rates in 2009 with trends since 1995: a systematic analysis. Lancet. 2011 Apr;377(9774):1319–30.
2. Pasha O, Saleem S, Ali S, Goudar SS, Garces A, Esamai F, et al. Maternal and newborn outcomes in Pakistan compared to other low and middle income countries in the Global Network's Maternal Newborn Health Registry: an active, community-based, pregnancy surveillance mechanism. Reprod Health. 2015 Dec 8;12(S2):S15.
3. Kramer MS. The Epidemiology of Adverse Pregnancy Outcomes: An Overview. J Nutr. 2003 May;133(5):1592S-1596S.
4. Vogel JP, Pileggi-Castro C, Chandra-Mouli V, Pileggi VN, Souza JP, Chou D, et al. Millennium Development Goal 5 and adolescents: looking back, moving forward. Arch Dis Child. 2015 Feb;100(Suppl 1):S43–7.
5. Warren JL, Perez-Heydrich C, Burgert CR, Emch ME. Influence of Demographic and Health Survey Point Displacements on Distance-Based Analyses. Spat Demogr. 2016 Jul 23;4(2):155–73.
6. Meherali S, Ali A, Khaliq A, Lassi ZS. Prevalence and determinants of contraception use in Pakistan: trend analysis from the Pakistan Demographic and Health Surveys (PDHS) dataset from 1990 to 2018. F1000Research. 2021 Aug 11;10:790.
7. Bhutta ZA, Hafeez A, Rizvi A, Ali N, Khan A, Ahmad F, et al. Reproductive, maternal, newborn, and child health in Pakistan: challenges and opportunities. Lancet. 2013 Jun;381(9884):2207–18.
8. Morris R, Meller C, Tamblyn J, Malin G, Riley R, Kilby M, et al. Association and prediction of amniotic fluid measurements for adverse pregnancy outcome: systematic review and meta-analysis. BJOG An Int J Obstet Gynaecol. 2014 May 7;121(6):686–99.
9. Locatelli A, Vergani P, Toso L, Verderio M, Pezzullo JC, Ghidini A. Perinatal outcome associated with oligohydramnios in uncomplicated term pregnancies. Arch Gynecol Obstet. 2004 Jan 20;269(2):130–3.
10. 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 Dec;181(6):1473–8.
11. 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 Sep 24;2(39):7386–91.
12. Talesara H, Shah VCC, Modi DA, Modi RS. Fetomaternal outcome in pregnancy with oligohydramnios: a prospective study. Int J Reprod Contraception, Obstet Gynecol. 2021 Jan 28;10(2):571.

13. Bachhav AA, Waikar M. Low Amniotic Fluid Index at Term as a Predictor of Adverse Perinatal Outcome. J Obstet Gynecol India. 2014 Apr 18;64(2):120–3.
14. 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 Apr;182(4):909–12.
15. Zhang J, Troendle J, Meikle S, Klebanoff MA, Rayburn WF. Isolated oligohydramnios is not associated with adverse perinatal outcomes. BJOG An Int J Obstet Gynaecol. 2004 Mar 11;111(3):220–5.
16. Bowen-Chatoor JS, Kulkarni SK. Amniotic fluid index in the management of the postdates pregnancy. West Indian Med J. 1995 Jun;44(2):64–6.
17. Ghosh R, Oza H, Padhiyar B. Maternal and fetal outcome in oligohydramnios: study from a tertiary care hospital, Ahmedabad, India. Int J Reprod Contraception, Obstet Gynecol. 2018 Feb 27;7(3):907.