PERINATAL AND MATERNAL OUTCOMES OF OLIGOHYDRAMNIOS IN THIRD TRIMESTER PREGNANCY: A CROSS SECTIONAL COMPARATIVE STUDY AT FELEGEHIWOT COMPREHENSIVE SPECIALIZED HOSPITAL AND TIBEBE GHION SPECIALIZED HOSPITAL , BAHIR DAR, NORTH WEST ETHIOPIA, 2019

Yismaw Yimam, MD[1], Kassahun Alamirew, MD[2], Dawud Muhammed, MD 2, Work Awoke, MPH [2]

ABSTRACT

INTRODUCTION: Oligohydramnios is commonly defined as an amniotic fluid index (AFI) ≤ 5 cm. It is considered a risk factor for adverse fetal and maternal outcomes.

OBJECTIVE: To compare perinatal and maternal outcomes among oligohydramnios and non-oligohydramnios pregnancies.

METHODS: A cross sectional comparative study with prospective facility based follow up study was done. The sample size is calculated to be 51 and 102, 1:2 for oligohydramnios and non-oligohydramnios, respectively.

RESULTS: The Cesarean delivery rate in women with oligohydramnios was 61%, compared to 22% in non-oligohydramnios group, which was statistically significant (P < 0.001). Five minutes Apgar score <7 was observed in 20 (40%) neonates in oligohydramnios and 16(15%) in non-oligohydramnios, which was statistically significant (p = 0.002). NICU admission was required for 14 (27 %) versus 11(10 %) babies in oligohydramnios and non-oligohydramnios, respectively; this is found to be statistically significant (p = 0.011). There was no difference in birth weight and need of neonatal resuscitation in both groups. The risk of adverse neonatal outcome was not related to GA at delivery, C/S, parity, age and antenatal follow up.

CONCLUSIONS: Oligohydramnios has a significant correlation with adverse perinatal and maternal outcome.

(The Ethiopian Journal of Reproductive Health; 2020; 12;45-55)

1 College of Medicine and Health Sciences, Debere Tabor University, Debre Tabor, Ethiopia

2 College Of Medicine and Health Sciences, Bahir Dar University, Bahir Dar, Ethiopia.

INTRODUCTION

Amniotic fluid (AF) surrounds the fetus after the first few weeks of gestation. It has a protective function for the fetus and the umbilical cord from trauma and compression. It also has anti-bacterial effects and provides the necessary conditions for normal development of fetal organ. Oligohydramnios is the decrease in the amniotic fluid with a four quadrant amniotic fluid index(AFI) less than 5 cm or amniotic fluid in one pocket less than 2 cm (1)

Common causes for Oligohydramnios were idiopathic (56%) and PIH (24%). Most common reason to perform caesarean was fetal distress. Oligohydramnios was related to higher rate of growth retardation and neonatal intensive care unit admission(2).

Oligohydramnios is thought to complicate 0.5% to 5.5% of all pregnancies, depending on the definition that is used and the population under study (3).

Amniotic fluid is assessed by amniotic fluid Index (AFI) by adding the depth in centimeters of largest vertical pocket in each four quadrants(4). In 2005 Leeman et al. reported oligohydramnios occurred in about 1 % to 5 % of pregnancies at term (5). In the absence of fetal anomalies, placental insufficiency has been proposed as a main etiology of reduced amniotic fluid volume. (6).

In obstetrics practice, lack of amniotic fluid at term is thought to be associated with a number of adverse ante partum, intra partum and perinatal maternal pregnancy outcomes. This includes a greater risk for non-reactive non-stress tests, increased risk for labor inductions, fetal heart rate decelerations in labor, meconium stained amniotic fluid, cesarean delivery for fetal labor intolerance, increased risk of stillbirth, NICU admissions, low Apgar scores and neonatal deaths (7).

In Ethiopia, there is no documented study on maternal and Perinatal outcome of oligohydramnios at third trimester pregnancy and its associated factors. Hence, this study was done to find out the impact of oligohydramnios on maternal and perinatal outcome at FHCSH and TGSH, northwest Ethiopia. It will be a bench for more advanced study on oligohydramnios.

METHODS AND MATERIALS

STUDY AREA AND PERIOD

The study was conducted in Felege Hiwot Comprehensive Specialized Hospital(FHCSH) and Tibebe Ghion Specialized Hospital(TGSH) from April 1 to August 30,2019.

Study design

A cross sectional-comparative study was conducted at FHCSH and TGSH.

Study population

All Third trimester pregnant women who were admitted to FHCSH and TGSH, maternity/high risk and labor ward with the diagnosis of oligohydramnios.

Inclusion and Exclusion criteria

Inclusion criteria: Women with singleton pregnancies ≥ 28 weeks of gestation with AFI less than 5 cm .

Exclusion criteria: Rupture of membrane confirmed by sterile speculum examination, multiple gestation, congenital anomalies and polyhydramnios were excluded from this research.

Sample size determination

A double population proportion formula using the assumptions of 95% confidence level and 5% margin of error was done used to estimate the sample size. Low birth weight rate with oligohydramnios and non-oligohydramnios was 37.33% and 16.4 4% respectively (Uma Mohanraj, S. Udaya Aruna. 2017)(34). Substituting the above assumption in the formula, the required sample size is calculated to be 51 and 102 with ratio of 1:2 for oligohydramnios and non-oligohydramnios respectively. All admitted within study periods were included.

Study Variables

Dependent Variable: perinatal and maternal outcomes

Perinatal outcome: IUFD, ENND, NICU admission, 5th minute Apgar score <7, low birth weight, need of resuscitation

Maternal outcome: mode of delivery.

Independent variables

- Socio-demographic variables: age, residence, level of education, marital status, occupation
- Obstetric factors: Parity, ANC status, gestational age, PIH, amniotic fluid volume and unknown cause.

Data collection

Data was collected by a pretested well-structured checklist, which was composed of three main parts; the socio-demographic data, the obstetric factors, and the perinatal and maternal outcomes. Data was collected by a four trained midwives and one resident.

Data Processing and Analysis

Data was entered in to Epi data version 3.1 then export to SPSS version 23 software packages for analysis. Descriptive statistics such as frequency and percentage was done. Bi variable logistic regression was used to determine the association between each independent variable and the outcome variable by p-value and OR. The association between dependent and independent variables further undergo multivariable logistic regression and interpreted by using the OR with 95% CI and p-value of <0.05.

Ethical clearance

Ethical clearance was obtained from the Ethical Review Board of college of medicine and health sciences, Bahir Dar University. Informed consent was taken and confidentiality was maintained when handling each case.

Results

5.1 Socio-demographic characteristics of the respondents

A total of 153 mothers and their records were reviewed and making the response rate of 100%.

Table 1 Sociodemographic characteristics of pregnant women who were admitted to obstetric and gynecologic ward, TGSH and FHCSH

Variables	Category	Oligohydramnios (n=51) No.(%)	Normal(n=102)No.(%)	P value
Age	Upto 20	7(13%)	9(9)	
	21-25	15(30)	30(29)	0.5
	26-30	17(33)	32(32)	
	>30	12(24)	31(31)	
Residence	Urban	29(57)	46(45)	0.6
	Rural	22(43)	56(55)	
Marital status	Single	4(8)	3(3)	0.98
	Married	47(92)	99(97)	
Occupation	Housewife	27(53)	67(66)	0.2
	Govt employee	9(17)	23(22)	
	Merchant	13(26)	9(9)	
	Other	2(4)	3(3)	
Educational status	Cannot write and read	17(33)	43(41)	
	Can read and write	5(10)	17(17)	0.16
	Elementary	5(10)	16(16)	
	Secondary	9(17)	13(13)	
	College and above	15(30)	13(13)	

Current and past Obstetrics factors

Oligohydramnios: From total of 51 mothers, 51% were primigravida,48(94%) had ANC follow up, 48(74%) were admitted at 37-42 weeks and 7(14%) were diagnosed to have hypertension.

Non-oligohydramnios: From total of 102 mothers, 32% were primigravida, 96% had ANC follow up,70 (69%) were admitted at 37-42 weeks .

Post term was seen among 16 % in oligohydramnios group versus 10 % in non-oligohydramnios. In the present study, 70 % cases are unknown.(Table 2)

Table 2 Obstetrical factors of pregnant women who were admitted to obstetric and gynecologic ward, TGSH and FHCSH

Variables	Category	Oligohydramnios No. (%)(n=51)	Normal(n=102) No. (%)
Gravidity	Primi	26(51)	33(32)
	2-4	14(27)	41(40)
	>=5	11(22)	28(28)
antenatal care follow up	NO	3(6)	4(4)
	YES	48(94)	98(96)
Gestational age	28-37 week	1(2)	13(13)
	37-42 week	38(74)	70(69)
	>=42weeks	8(16)	10(10)
	Unknown	4(8)	9(8)
Hypertension	YES	7(14)	10(10)
	NO	44(86)	92(90)
Other factors	Abruption placenta	5(10)	
	Medication(ACEI,ARB,NSAIDS)	1(2)	2(2)
Unknown cause		36(70)	88(86)

Maternal and perinatal outcome

As regards to mode of delivery, it was observed that 61% had C/S delivery in oligohydramnios group which was higher compared to the non-oligohydramnios group (22%) . In addition, 60% of those with oligohydramnios had Apgar score > 7. Birth weight were normal in oligohydramnios and non-oligohydramnios (71% versus 80 % respectively). There were no neonatal deaths in oligohydramnios group, but there was 2% ENND in non-oligohydramnios. NICU admission is greater in oligohydramnios than no oligohydramnios (27% and 10%, respectively) (Table 3).

Table 3 Maternal and perinatal outcome pregnant women who had admitted to obstetric and gynecologic ward, TGSH and FHCSH

Variables	Category	Oligohydramnio (n=51) No.(%)	Normal(n=102) No.(%)
Birth weight	1000-2499grams	15(29)	21(20)
	≥2500grams	36(71)	81(80)
Five minute Apgar less than 7	Yes	20(40)	16(15)
	No	31(60)	86(85)
Need for resuscitation	Yes	18(35)	16(15)
	No	33(65)	86(85)
NICU admission	Yes	14(27)	11(10)
	NO	37(73)	91(90)
ENND	Yes	0	2(2)
	No	51(100)	100(98)
Mode of delivery	Vaginal	20(39)	80(78)
	C/S	31(61)	22(22)

5-min APGAR score <7 was observed in 20 (40%) neonates in oligohydramnios (p = 0.002) and 16(15%) in non oligohydramnios. The results confirmed that those with oligohydramnios were nearly four times higher odds for less than 7 APGAR score at five minutes compared to those with no oligohydramnios (COR: 3.48; 95%CI: 1.59-7.53) .

Low birth weight was found in 12(23%) in oligohydramnios Versus 18 (18%) in non-oligohydramnios women; this is not statistically significant (p = 0.589).

NICU admission was required for 14 (27 %) versus 11(10 %) babies in oligohydramnios and no oligohydramnios, respectively; this is found to be statistically significant (p = 0.011). There was 2% ENND in non oligohydramnios ,this is not statistically significant.

Moreover 35 % of newborn was in need for resuscitation in oligohydramnios compared to 15% of no oligohydramnios group. But this is not statistically significant (p=0.076)

TABLE 5.Bivariate analysis of factors associated with low APGAR score of newborn

Variables	Category	APGAR		COR(95% CI)	P value
		Less than 7(n=36) No.(%)	>=7(n=117) No.(%)		
Occupation	Housewife	25(70)	69(60)	4.140(.65-26.2)	.132
	Govt employee	5(14)	27(22)	8.100(1.0-61.5)	.043
	Merchant	3(8)	19(16)	9.500(1.0-82.7)`	.041
	Other	3(8)	2(2)	1	
Educational status	Cannot write and read	16(44.5)	44(37)	1.100 (0.4-2.9)	.852
	Can read and write	2(5.5)	21(18)	4.200(0.79-22)	.091
	Elementary	6(17)	14(11)	.933(0.26-3.22)	.915
	Secondary	4(11)	8(17)	1.80(0.46-7.00)	.396
	College and above	8(22)	20(17)	1	
Gravidity	Primi	15(41.7)	44(37.6)	1	
	2-4	7(19.3)	48(41)	1.64()	268
	>=5	14(39)	25(21.4)	3.84()	.010
Amniotic fluid volume	Oligohydramnios	20 (55.6)	31(26.5)	3.46(1.59-7.52)	0.002
	Non oligohydramnios	16(44.4)	86(73.5)		

Table 6 Bivariate analysis of factors associated with newborn who need resuscitation

Variables	Category	Need of resuscitation		OR(95% CI)	P value
		Yes (n=34) No.(%)	NO(n=119) No.(%)		
Occupation	Housewife	23(67.4)	71(60)	2.26(.71-7.15)	.162
	Govt employee	4(11.8)	28(23.2)	2.05(.55-7.56)	.281
	Merchant	3(9)	19(16)	.08(.009-.76)	.028
	Other	4(11.8)	1(0.8)	1	1
Gravidity	Primigravida	8(23.5)	51(43)	3.984(1.4-10.6)	.006
	2-4	11(32)	44(37)	2.500(.99-6.2)	.0528
	>=5	15(44.5)	24(20)	1	
Amniotic fluid volume	Oligohydramnios	7(20.5)	44(37)	2.263(.91-5.6)	.079
	Non oligohydramnios	27(79.5)	75(63)	1	

Table 7. Bivariate analysis of factors associated with newborn who need NICU admission

Variables	Category	NICU admission		OR(95% CI)	P value
		YES(n=25) No.(%)	NO(n=128) No.(%)		
Occupation	Housewife	13(52)	81(63)	9.3(1.4-61)	.020
	Govt employee	4(16)	28(22)	10.5(1.3-83)	.026
	Merchant	5(20)	17(13.3)	5.1(.65-39)	.119
	Other	3(12)	2(1.7)	1	
Marital status	Single	3(12)	4(3)	4.22(.88-20.20)	071
	married	25(88)	124(97)	1	
Educational status	Cannot write and read	9(36)	51(40)	2.26(.76-6.65)	.139
	Can read and write	1(4)	22(17)	8.80(1.01-76)	.049
	Elementary	4(16)	16(12.5)	1.60(.40-6.28)	.501
	Secondary	3(12)	19(15)	2.53(.58-10.9)	.215
	College and above	8(32)	20(15.5)	1	
Amniotic fluid volume	Oligohydramnios	3(12)	4(3)	3.13()1.30-7.52	.011
	Non oligohydramnios	22(88)	124(97)		

Cesarean delivery was higher in the oligohydramnios group (61%), compared to the non oligohydramnios group (22%). In current study, statistically significant (P =0.001)

Women with oligohydramnios were nearly seven times more likely to have cesarean section to deliver the baby than non oligohydramnios, (AOR: 6.53; 95 CI: 2.82-15.2)

After adjusted for the effect of occupational status , residence, educational status and gestational age; increased C/S rate that remained significantly associated with only oligohydramnios

Table 8, multivariable analysis of factors associated with mode of delivery of pregnant women who were admitted to Obstetric and gynecologic ward, TGSH and FHCSH

Variables	**Category**	**Mode of delivery**		**OR(95% CI)**	**AOR(95 CI)**	**P value**
		CD(n=53) No.(%)	Vaginal delivery(n=100) No.(%)			
Occupation	Housewife	26(49)	68(68)	1		
	Govt employee	16(30.2)	16(16)	0.25(0.05-1.1)		0.21
	Merchant	10(18.9)	12(12)	0.73(0.177-3.0)		0.06
	Other	1(1.9)	4(4)	2.49(0.196-31)		0.66
Residence	Urban	30(56.7)	45(45)	1		
	Rural	23(43.3)	55(55)	1.59 (0.81-3.12)		0.17
Educational status	Cannot write and read	17(32)	43(43)	3.37(1.32-8.59)		011
	Can read and write	43(81)	18(18)	4.80(1.38-16.6)		013
	Elementary	7(12)	13(13)	2.47(0.75-8.10)	.	134
	Secondary	8(15)	14(14)	2.33(0.74-7.34)	.	148
	College and above	16(30)	12(12)	1		
Gestational age	28-37 week	4(7.5)	10(10)	1.111(0.25-5.80)		.901
	37-42 week	34(64)	74(74)	.967(0.27-3.33)		.958
	>=42weeks	11(21)	7(7)	283(0.06-1.28)	.	102
	Unknown	4(7.5)	9(9)	1		
Amniotic fluid volume	Oligohydramnios	31(58.5)	20(20)	5.63 (2.7-11.7)	6.53 (2.82-15.2)	0.00 01
	Non oligohydramnios	22(41.5)	80(80)	1		

Table 9. Multivariable analysis of factors associated with adverse neonatal outcome, pregnant women who were admitted to Obstetric and gynecologic ward, TGSH and FHCSH, 2019

Variables	Category	Composite perinatal outcome		AOR(95% CI)
		Bad(n=101) No.(%)	Good(n=52) No.(%)	
Age	Upto 20	11(11.8)	4(7.7)	1
	21-25	32(31.7)	13(25)	.58(0.12-2.80)
	26-30	32(31.7)	18(34.7)	1.51(0.27-8.22)
	>30	26(27.8)	17(32.6)	2.44(0.34-17.22)
Educational status	Cannot write and read	39(39)	21(40)	3.7(0.34-4.8)
	Can read and write	12(12)	11(21)	5.1(0.14-3.3)
	Elementary	4(4)	6(11.5).	2.5(0.24-6.54)
	Secondary	13(13)	9(17)	4.7(0.04-1.68)
	College and above	23(22)	5(10.5)	1
Gravidity	Primi	43(42.6)	16(30.8)	3.39(0.32-3.30)
	2-4	31(30.7)	24(68)	3.42(0.04-1.78)
	>=5	27(26.7)	12(23.2)	1
Gestational age	28-37 week	12(12)	2(3.8)	3.97(0.69-22.8)
	37-42 week	68(67)	40(77)	1.37(0.15-12.19)
	>=42weeks	15(15)	3(5.8)	7.12(0.88-57)
	Unknown	6(6)	7(13.4)	1
Amniotic fluid	Oligohydramnios	42(42)	9(17)	4.13(1.44-11.85)
	Non oligohydramnios	59(58)	43(83)	1

DISCUSSION

Assessment of amniotic fluid volume during the antenatal period is considered a helpful tool in determining who is at risk for adverse neonatal outcome .Hence, this study was undertaken to assess the value of oligohydramnios in mode of delivery and neonatal outcomes.

In current study maximum number of women who had oligohydramnios (n=51) belonged to age of 21-30 years (68%) which is comparable to the study of Sita Ghimire, in Nepal [26]

Most of the primigravida (51%) had oligohydramnios. Similar result was obtained in a study done by Rooplekha Chauhan, India where it was 59%.Sita Ghimire also reported that incidence of oligohydramnios was more in primigravida (58.0%) [26]

In present study caesarean section was done in 61 % of oligohydramnios. Percentage of caesarean section in different studies done by Lei et al, hou et al, kanur were 89.9 %, 38%, 48 %, respectively. We noted a 7-fold higher caesarian section rate in oligohydramnios as compared non oligohydramnios [7, 12,27].

In addition Hamed A, Egypt observed that CS done in 42% in oligohydramnios group and 20% in non oligohydramnios group with statistically significant increase in rate of CS in oligohydramnios group.[33]

The difference could be explained by the fact that deficient quality resources of ante partum and intrapartum fetal monitoring in the present study setting might influence the rate of detection of all the parameters of fetal heart rate tracing. CS was mostly the best option to overcome the adverse effect on the perinatal outcome.

Concerning the neonatal outcome, our study showed statistically significant low Apgar score in oligohydramnios (40% versus. 15%) when compared with non oligohydramnios group. Similar results were observed by Bachhav et al showed that 34 % in the oligohydramnios group and 10 % in the no oligohydramnios group (p = 0.0003) [31]

Ghimire, et al who noted an APGAR score of < 7 at 5 min in (20 versus 7%) compared with no oligohydramnios,

and also by Sreelakshmi U et al. who noted an APGAR score of < 7 at 5 min in(21 versus 9%) (28, 29) .

This difference of above mentioned results could be attributed to the available better intrapartum fetal assessment facilities in developed countries. Our result was higher that might be because of lack of CTG to detect signs of hypoxia earlier in oligohydramnios.

In the current study, neonatal admission was found to be significantly higher in oligohydramnios (27 versus 10 %) group when compared with non oligohydramnios group. In Kensal et al study it was 28% of the babies who required NICU admission. This is consistent with a study conducted by Panda et al.2016, NICU admission among babies in oligohydramnios versus no oligohydramnios was (24 %) versus (12 %). Similar study also revealed that Statistical significant difference was noted between the two groups (p=0.003*) (33)

But admission to NICU were not statistically different in the oligohydramnios group from the normal group (23 versus 16%)in Sreelakshmi U et al. Int J Reprod Contracept Obstet Gynecol. 2018,this difference may need further study.[12, 28, 30]

The current study has also demonstrate that 29 %versus 20% neonates had birth weight is less than 2.5 kg (p =0.22) with no statistical significant difference with respect to low birth weight with oligohydramnios. In addition, study by Bachhav et al. low birth weight was 17 % in oligohydramnios.

There were no neonatal deaths in oligohydramnios group, but there was 2% ENND in non oligohydramnios, this may be attributed to the study design and small sample size. It needs further study.

In contrast study by Uma Mohan raj, birth weight< 2.5 kg, the oligohydramnios group against control group (37.33 versus 16.44) in was significant.[34]

Study by Amany Hamed also showed, no statistical significant difference (p=0.26). The discrepancy among various studies addressing this birth weight has been attributed to the study design, sample size and its characteristics in- addition to meticulous care and attention provided for oligohydramnios patients during the antenatal period (7, 31-33)

Conclusions; An amniotic fluid index of ≤ 5 cm detected was an indicator of poor perinatal outcome. There is a significant association between the severity of oligohydramnios and fetal outcome in term of low Apgar score and NICU admission. There was an increased adverse maternal outcomes in terms of rate of Cesarean section

Strength of study; As I mentioned before, it is the first study in Ethiopia, it is the bench for more advanced research in this topic.

Limitations of study; Our study design cross-sectional comparative.our survey only included tertiary hospitals, it excluded people who live in certain rural areas .Our results especially ,the neonatal outcomes, may be better than those from primary hospitals. The use of back up surveillance methods like scalp blood sampling and acoustic stimulation would have altered the outcome. Some useful information was missing, such as non-stress test and umbilical cord PH. We only had information about immediate perinatal morbidity and mortality until time of discharge from the hospital, and therefore, some outcomes might be underestimated.

Recommendation;

Early detection of oligohydramnios and its management may help in reducing the rate of caesarean deliveries. Vaginal delivery and caesarean section should be well balanced by avail CTG in labor ward, so that unnecessary maternal morbidities are prevented.

For researcher, further study with large sample size and better study design in different institution is recommended.

Further study also recommended on Perinatal and maternal outcome of Isolated oligohydramnios at term.

ACRONYMS

ANC	Antenatal care
ANRS	Amhara National Regional State
AOR	Adjusted odd ratio
CI	Confidence interval
COR	Crude odd ratio
ENND	Early neonatal death
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
GA	Gestational age
IO	Isolated oligohydramnios
IUFD	Intrauterine Fetal Death
IUGR	Intrauterine Growth Restriction
LUST CS	Lower uterine segment transverse cesarean section
NICU	Neonatal Intensive Care Unit
PIH	pregnancy induced hypertension
TGSH	Tibebe Ghion Specialized Hospital

ACKNOWLEDGEMENT

I would like to express my gratitude to department of gynecology and obstetrics, College of Medicine and Health Sciences, Bahir-Dar University for giving me the opportunity to do this research. I would like to express my deepest gratitude and appreciation to Dr. Kassahun Alamirew, Dr. Dawud Muhammed, Mr. Worku Awoke ,Mr. Andargie Abate and Mr. Gedefaye Nibret for their valuable comments and scientific suggestions. I would like to thank all pregnant women who agreed to participate in the study.

CORRESPONDING AUTHOR:

Email:yismawyimam17g@gmail.com
kassahun1964@gmail.com
muftidawud67@gmail.com
workuawo@yahoo.com

REFERENCES

1. Adel NM, Abd-ElGawad EA, Abdel Hakeem AKA. Diagnostic value of four dimensional ultrasound in detection of fetal causes of oligohydramnios: An observational study. The Egyptian Journal of Radiology and Nuclear Medicine. 2017; 48(4):1141-7.
2. Bhat S1 KV. Study of effect of Oligohydramnios on maternal and fetal outcome IJMDS. 2015; 4(1).
3. Brzezinski-Sinai NA, Staversusky M, Rafaeli-Yehudai T, Yitshak-Sade M, Brzezinski-Sinai I, and Imterat M, et al.: journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2018:1-9.
4. Purvi K Patel, Dipa S Pitre, Harshita Gupta. pregnancy outcome in isolated oligohydramnios at term ;National Journal of Community Medicine Vol- 6(2) Apr – Jun 2015
5. Lawrence Leeman David A. Isolated oligohydramnios at term,is induction indicated; The Journal of family practice. 2005; 54(1).
6. Rhoades JS, Stout MJ, Macones GA, Cahill AG. Effect of Oligohydramnios on Fetal Heart Rate Patterns during Term Labor Induction. American journal of perinatology. 2018.
7. Hou L, Wang X, Hellerstein S, Zou L, Ruan Y, Zhang W. Delivery mode and perinatal outcomes after diagnosis of oligohydramnios at term in China. J Maternal Fetal Neonatal Med. 2018:1-181.
8. Bhagat M, Chawla I. Correlation of amniotic fluid index with perinatal outcome. Journal of obstetrics and gynecology of India. 2014; 64(1):32-5.
9. Tahmina S, Prakash S, Daniel M. Maternal and perinatal outcomes of induction of labor in oligohydramnios at term . The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2018:1-101.
10. Naveiro-Fuentes M, Prieto AP, Ruiz RS, Badillo MPC, Ventoso FM, Vallejo JLG. Perinatal outcomes with isolated oligohydramnios at term pregnancy. Journal of perinatal medicine. 2016; 44(7):793-8.
11. LANGER DMSaO. Oligohydramnios: use and misuse in clinical Management. Ultrasound Obstet Gynecol 2001; 18:411-9.
12. Kansal R, Bansal I, Singla D, Agrawal N, Thami G. Oligohydramnios maternal & fetal outcome in pregnant females. Asian Pacific Journal of Health Sciences. 2017; 4 (2):235-40.
13. Biradar K, Shamanewadi A. Maternal and perinatal outcome in oligohydramnios: study from a tertiary care hospital, Bangalore, Karnataka, India. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2016:2291-4.
14. Rossi AC, Prefumo F. Perinatal outcomes of isolated oligohydramnios at term and post-term pregnancy: a systematic review of literature with meta-analysis. European journal of obstetrics, gynecology, and reproductive biology. 2013; 169 (2):149-54.
15. Shrem G, Nagawkar SS, Hallak M, Walfisch A. Isolated Oligohydramnios at Term as an Indication for Labor Induction: A Systematic Review and Meta-Analysis. Fetal diagnosis and therapy. 2016; 40(3):161-73.
16. Sahin E, Madendag Y, Tayyar AT, Sahin ME, Col Madendag I, Acmaz G, et al. Perinatal outcomes in uncomplicated late preterm pregnancies with borderline oligohydramnios. J Maternal Fetal Neonatal Med. 2018; 31 (23):3085-8.
17. ManiSha SharMa, D K BhaGwani k. Maternal and Perinatal Outcome in Pregnancies with Oligohydramnios in Third Trimester Indian Journal of Neonatal Medicine and Research. 2016 July, Vol-4(3): OO01-OO05.
18. Mangal PuriKanika SharmaLow amniotic fluid index and intranatal and perinatal outcome in term pregnancy International Journal of Medical and Health Research, medicalsciencejournal.com Vol- 3(11): November 2017; 129-134
19. 1 Dr. Mangal Puri DKS. Low amniotic fluid index and intranatal and perinatal outcome in term pregnancy International Journal of Medical and Health Research ISSN: 2454-9142 Impact Factor. 2017; 3(11).
20. Sita Ghimire AG, Saugat Chapagain, Sumitra Paudel. Pregnancy outcome in cases of oligohydramnios after28 weeks of gestation.Int J Adv Med Health Res 2016; 3)
21. Nesa Asnafi1, Zinatossadat Bouzari2, 3*, Maede Mohammadnetadj4. Oligohydramnios and Pregnancy Outcome: Ten-Year Review. IBBJwinter 2015; 1(1).
22. Charu Jandial* SG, Sudhaa Sharma, Manju Gupta**.Perinatal Outcome after Antepartum Diagnosis of Oligohydramnios at or Beyond 34 Weeks of Gestation. 2007;9.
23. Zhang J, Troendle J, Meikle S, Klebanoff MA, Rayburn WF. Isolated oligohydramnios is not associated with adverse perinatal outcomes. BJOG: An International Journal of Obstetrics and Gynaecology. 2004; 111(3):220-5.
24. Mohamed AHG. Pregnancy Outcome among Patients with Oligohydramnios and Suggested Plan of Action. IOSR Journal of Nursing and Health Science (IOSR-JNHS). 2015;4 (15).
25. Radha Devi Dhakal1 DDP. Oligohydramnios associated factors among pregnant Women: a cross-sectional study from Bharatpur, Nepal. Medical Science 2017; Sep, Vol-5(3. 2017; 5(3).esog
26. Chauhan R, Sahni S, Dubey A. A study on fetal outcome in patients with oligohydramnios. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2019; 8(2):665.

27. Kaur P, Desai D, Taraiya A. A study on the perinatal outcome in cases of oligohydramnios. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2016:98-109.
28. U S, Bindu T, T S. Impact of oligohydramnios on maternal and perinatal outcome: a comparative study. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2018; 7 (8):3205.
29. Ghimire S, Ghimire A, Chapagain S, Paudel S. Pregnancy outcome in cases of oligohydramnios after 28 weeks of gestation. International Journal of Advanced Medical and Health Research. 2016;3 (2):68.
30. Panda S, Jayalakshmi M, Shashi Kumari G, Mahalakshmi G, Srujan Y, Anusha V. Oligoamnios and Perinatal Outcome. J Obstet Gynaecol India. 2017;67 (2):104-8.
31. Bachhav AA, Waikar M. Low amniotic fluid index at term as a predictor of adverse perinatal outcome. J Obstet Gynaecol India. 2014; 64(2):120-3.
32. Jayati Nath1 MJ, Rehana Najam.A Clinical Study on Oligohydramnios In The Third Trimester Of Pregnancy With Special Emphasis On The Perinatal Outcome. Journal of Evolution of Medical and Dental Sciences 2013; 2013; 2(39).
33. Hamed A. Pregnancy Outcome among Patients with Oligohydramnios and Suggested Plan of Action. IOSR Journal of Nursing and Health Science (IOSR-JNHS). 2015.
34. Uma Mohanraj, S. Udaya Aruna. Maternal and Perinatal Outcome In Pregnancies With Oligohydramnios At Term; Journal of Research in Obstetrics, Gynecology and Infertility, Vol. 3(1) Jan-June, 2017.