

ORIGINAL RESEARCH ARTICLE

Perinatal outcome of oligohydramnios in academic hospitals in a low resource setting

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Abstract

Oligohydramnios has been a topical issue in obstetrics. The prevalence of oligohydramnios ranges from 1 to 5%. Conflicting data exists concerning its effects on adverse perinatal outcome. This study aims to assess perinatal outcomes of oligohydramnios at the Mekelle Public Hospitals from April 1, 2018 – March 31, 2019. This was a cross-sectional study and a total population purposive sampling method was employed to collect data prospectively. During the study period, there were a total of 10,451 deliveries in both hospitals. Oligohydramnios complicated 332 pregnancies (3.2%, 95%CI: 2.9%, 3.5%) across all gestations and 273 pregnancies (2.6%, 95% CI: 2.3%, 2.9%) at term. The composite adverse perinatal outcome rate was 29.7% (95% CI, 24.5, 35.4). Primigravidity and presenting at post-term gestation were associated with adverse perinatal outcome. Nearly 70% of mothers gave birth via Cesarean delivery. Oligohydramnios was found to be associated with a significant increase in adverse newborn and maternal outcomes in the study setting. Although a significant proportion of mothers underwent Cesarean delivery for a perceived increased complications associated with vaginal delivery in this population of patients, Cesarean delivery was found to not improve perinatal outcome. Primigravids and postdated pregnancies must receive increased surveillance to detect oligohydramnios early and to institute appropriate and timely interventions. Indications for Cesarean delivery in patients complicated by oligohydramnios must be carefully examined to balance the benefit on the perinatal outcome on the one hand and to avoid unnecessary major surgery with potential fatal maternal complications on the other. (*Afr J Reprod Health* 2023; 27 [4]: 54-64).

Keywords: Oligohydramnios, perinatal outcome, maternal outcome, low resource settings

Résumé

L'oligohydramnios est un sujet d'actualité en obstétrique. La prévalence de l'oligohydramnios varie de 1 à 5 %. Il existe des données contradictoires concernant ses effets sur les issues périnatales indésirables. Cette étude vise à évaluer les résultats périnataux de l'oligohydramnios dans les hôpitaux publics de Mekelle du 1er avril 2018 au 31 mars 2019. Il s'agissait d'une étude transversale et une méthode d'échantillonnage raisonné de la population totale a été utilisée pour collecter des données de manière prospective. Au cours de la période d'étude, il y a eu un total de 10 451 accouchements dans les deux hôpitaux. L'oligohydramnios a compliqué 332 grossesses (3,2 %, IC à 95 % : 2,9 %, 3,5 %) pour toutes les gestations et 273 grossesses (2,6 %, IC à 95 % : 2,3 %, 2,9 %) à terme. Le taux composite d'issues périnatales indésirables était de 29,7 % (IC à 95 %, 24,5, 35,4). La primigravité et la présentation à la fin de la grossesse ont été associées à des résultats périnataux indésirables. Près de 70 % des mères ont accouché par césarienne. L'oligohydramnios s'est avéré être associé à une augmentation significative des résultats indésirables pour le nouveau-né et la mère dans le cadre de l'étude. Bien qu'une proportion importante de mères aient subi un accouchement par césarienne en raison d'une augmentation perçue des complications associées à l'accouchement vaginal dans cette population de patientes, il a été constaté que l'accouchement par césarienne n'améliorait pas les résultats périnataux. Les primigestes et les grossesses postdatées doivent faire l'objet d'une surveillance accrue pour détecter précocement l'oligohydramnios et mettre en place des interventions appropriées et opportunes. Les indications de césarienne chez les patientes compliquées d'oligohydramnios doivent être soigneusement examinées pour équilibrer le bénéfice sur le résultat périnatal d'une part et pour éviter une chirurgie majeure inutile avec des complications maternelles potentiellement mortelles d'autre part. (*Afr J Reprod Health* 2023; 27 [4]: 54-64).

Mots-clés: Oligohydramnios, issue périnatale, issue maternelle, milieux à faibles ressources

Introduction

The amniotic fluid enables continued foetal growth in a non-restricted, sterile, and thermally controlled environment and provides an optimal environment for the development of lung, musculoskeletal and gastrointestinal systems¹⁻³. Amniotic fluid index (AFI) and the single deepest vertical pocket (SDVP) are the two methods commonly used to determine amniotic fluid volume⁴. Amniotic fluid index is calculated by adding the depth in centimeters of 4 different fluid pockets not containing cord or fetal extremities in 4 abdominal quadrants using the umbilicus as a reference point and with the transducer perpendicular to the floor⁵⁻⁷. Single deepest vertical pocket refers to the vertical dimension of the largest pocket of amniotic fluid with a horizontal measure of at least 1 centimetre that does not contain the umbilical cord or the fetal extremities and is measured at a right angle to the uterine contour and perpendicular to the floor⁶⁻⁸. AFI and SDVP have been validated as an accurate and reproducible technique for assessing the volume of amniotic fluid volume⁹. Excessive or deficient amniotic fluid volume (AFV) has been associated with an increased anomaly rate, as well as increased perinatal morbidity and mortality^{8,10}.

Oligohydramnios is a state of deficient amniotic fluid defined sonographically as the single deepest vertical pocket (SDPVP) less than two centimeters and / or the amniotic fluid index (AFI) less than 5 centimeters¹¹. Studies from different institutions and countries have shown that the prevalence of oligohydramnios ranges from 1-5% at term but can go as high as 12-14 % after 41 weeks and up to 30% in post-term pregnancies¹¹⁻¹⁶. The reported prevalence of oligohydramnios at term gestation in Ethiopia is 2.3%¹⁶. The commonest and persistent maternal causes and risk factors for oligohydramnios are hypertension, anemia, premature rupture of the membrane (PROM), postterm pregnancy and abruption^{1, 12,17}. Chronic abruption can lead to a condition called the chronic-abruption-oligohydramnios sequence (CAOS) in early pregnancy¹⁸. There are also case reports of malaria as a cause of oligohydramnios¹⁹. Fetal congenital anomalies of the kidneys and urinary tracts (CAKUT), Potter syndrome, amniotic band syndrome, growth restriction, and fetal pulmonary

hypoplasia are commonly associated with oligohydramnios^{17,20-23}.

Oligohydramnios puts mothers at risk of procedures and operative interventions of induction and Cesarean delivery (CD)^{1,5,9,13}. Studies carried out among different study groups in the United States, Nigeria, Nepal, India, and Pakistan show CD rates of 20.2%, 30.8%, 64%, and 83.6% in association with oligohydramnios, respectively^{1,9,24,25}. Mothers with oligohydramnios are at increased risk for labor induction and CD^{4,12,20,26,27}. Studies show a high CD rate in both high-income and low-income countries ranging from 42.0 – 83.6%^{1,2,5,12,13,17,28}. The decision between vaginal and CDs in pregnancies complicated with oligohydramnios should be well balanced^{2,15,29}. Oligohydramnios is also associated with low Apgar scores and admissions to the neonatal intensive care unit (NICU), even in the absence of other 'high-risk' characteristics¹⁷. The risk of meconium-stained liquor can be as high as 40-44%, respiratory distress as high as 13%, admission to the NICU as high as 15-19%, perinatal death 2.4 – 6.4 %, and the composite adverse perinatal outcomes can go as high as 15%¹⁶. Rates of foetal distress in labor can go as high as 30% and as high as 20% of neonates have low first minute Apgar³⁰. More importantly, adverse perinatal outcome is significantly more frequent with severely diminished liquor compared with borderline amniotic fluid volume^{5,31-33}. Oligohydramnios is also of special concern when it occurs in conjunction with structural fetal anomalies, IUGR, postdates pregnancies, and maternal diseases^{34,35}.

As electronic fetal monitoring with pattern interpretation is unavailable in the study setting, mothers with severe oligohydramnios are followed by intermittent auscultations. Oligohydramnios is likely associated with grave perinatal outcome in settings lacking continuous fetal monitoring in labor. However, studies examining the impact of oligohydramnios on perinatal outcome in such settings are lacking. With this in mind, this study aimed to examine the degree of adverse perinatal and maternal outcomes associated with pregnancies complicated with oligohydramnios in a setting where continuous electronic fetal monitoring in labour is unavailable.

Methods

Study setting

The study was conducted at Ayder Comprehensive Specialized Hospital (ACSH) and Mekelle General Hospital (MGH). Both are public hospitals with specialty services in the Tigray region of northern Ethiopia. Each hospital hosts an average of 5000 of deliveries per annum. As both serve as referral centers, majority of mothers who deliver in this setting are high risk. Obstetric ultrasound is an integral part of the 4-year postgraduate specialty training program in Obstetrics and Gynecology in the study setting. Both residents and consultants scan mothers at the low-and high-risk clinics, maternity, and labour wards. Per the institutional protocol, either the senior resident or the consultant gives decisions related to obstetric complications or abnormalities picked up by ultrasound. Continuous electronic fetal monitoring with tracing and pattern interpretation in labor is lacking in both hospitals. However, both hospitals employ cardiotocography (CTG) machines for continuous monitoring without pattern interpretation, i.e., only spot observations of abnormalities in the screen of the CTG machines.

Study design

This was a prospective observational study.

Source population

All pregnant women who seek service at Mekelle town public hospitals from April 1, 2018 – March 31, 2019.

Study population

Pregnant mothers scanned at low- and -high risk clinics, and maternity ward and who were diagnosed to have oligohydramnios were recruited for the study. When the senior resident or the consultant decides for termination of pregnancy owing to the oligohydramnios complication the mothers were checked for inclusion criteria. All pregnant women who were diagnosed to have oligohydramnios by ultrasound and getting service at ACSH and MGH during the study period were taken as the study population.

Study subjects

All pregnant women who fulfilled the inclusion criteria are enrolled in the study.

Eligibility criteria

Inclusion criteria

1. Gestational age after 37⁺⁰ weeks of gestation calculated from reliable date or calculated from ultrasound taken before 24 weeks gestation
2. Singleton gestations
3. When the ultrasound measured AFI < 5 cms

Exclusion criteria

1. Women with premature rupture of membranes (PROM)
2. Mothers who are admitted with the diagnosis of oligohydramnios and corrected after rehydration. As per the institutional protocol, with the intention of “rehydrating the baby through the mother” women with oligohydramnios and no apparent cause were ordered to drink two liters of water. Women whose amniotic fluid volume corrected with rehydration were excluded from the study.
3. Women with Intrapartum fetal death (IUFD) at presentation

Sample size determination

The sample size of the study was calculated using single proportion formula and percentage of composite adverse perinatal outcome in women with oligohydramnios at term was taken 9.7 % from a literature review³⁶. Assuming 95% confidence level, the minimum sample size required was 135.

$$n = \frac{(z_{\alpha/2})^2 p(1-p)}{d^2} = (1.96)^2 * 0.097 * (1-0.097) / (0.05)^2 = 135$$

Sampling technique/procedure

The study was conducted at ACSH and MGH. These two hospitals are chosen for their caseload and specialty services. The total population purposive sampling technique was employed to enroll all mothers who are admitted with oligohydramnios after 37⁺⁰ weeks of gestation.

Data collection

Data was collected using a pretested structured questionnaire that was adopted from a literature review. The questionnaire contained sociodemographic (maternal age, residence, marital status, level of education, and occupation), obstetric (gravidity, ANC follow up status, gestational age at diagnosis, degree of oligohydramnios, and previous history of abortion), and neonatal (birth weight, APGAR scores, neonatal complications such as admission to N-ICU, meconium aspiration syndrome, and perinatal death) variables. It was administered to women who were admitted for termination by the responsible resident. Consent was obtained for data extraction.

Data quality management

To maintain the data quality standardized checklist adopted from literature was used. The data was collected by trained midwives and residents under the supervision of the principal investigator. Data was reviewed and checked daily by the supervisors for their completeness.

Data processing and analysis

Data was coded, entered into, cleaned, and analyzed using STATA 16. Frequency tables, graphs, and cross-tabulations were used for data presentation. Chi-square test of association was employed to assess the association between socio-demographic and obstetric factors and composite adverse perinatal and maternal outcomes. Fisher's exact test was used in variables containing less than 5 expected counts per cell.

Logistic regression analysis was used to identify the independent factors associated with composite adverse perinatal and maternal outcomes. Bivariate logistic regression was used to identify independent variables significant at a P-value of < 0.25 and multivariable logistic regression was computed to identify independent predictors of adverse perinatal outcomes. Hosmer Lemeshow test was used to assess model fitness and it was insignificant ($p=0.987$) telling that the model was good fit for the data. There was no multicollinearity issue (maximum variance inflation factor (VIF)=1.29, mean VIF=1.17). Odds ratios [OR] with 95% confidence interval were calculated.

Statistical significance was accepted at the 5% level [$p<0.05$].

Five perinatal adverse outcomes including, low first minute or fifth minute APGAR score, low birth weight, admission to N – ICU, presence of thick meconium, and perinatal death were computed into one variable defined as a composite adverse perinatal outcome. Both Pearson's Chi-square and logistic regression analyses were run to see the association between socio-demographic variables and composite adverse outcomes as well as to see predictors of composite adverse outcomes respectively.

Results

Sociodemographic and obstetric profile

During the study period a total of 10,451 women gave birth in both institutions of the study area. From a total of 332 sampled women with oligohydramnios, 59 were excluded for reasons including presentation at preterm gestational age, unknown or unreliable last date or absence of early milestones to date the pregnancy. All the remaining 273 women were enrolled giving 100% response rate. This makes the prevalence of oligohydramnios 3.2% across all gestations and 2.6% in those who presented after 37⁺⁰ weeks of gestation with optimally dated pregnancy.

The mean age of the study participants was 26.7±4.7 years. Most of the study participants ($n = 244, 89.4\%$) were in the age group of 20 – 34 years with minimum and maximum age of the study participants being 18 and 45 years. Majority of the study participants [$n = 240, 87.9\%$] reside in the urban setting. Interm of educational background, [$n = 106, 38.8\%$] attended secondary school, [$n = 97, 35.5\%$], graduated from university or college, and [$n = 51, 18.7\%$] attended elementary school. The remaining participants [$n = 19, 7.0\%$] had no formal education. Sixty-three-point four percent of participants are house-wives, while the remaining [$n = 66, 24.2\%$, $n = 26, 9.5\%$, $n = 8, 2.9\%$] are government employees, self-employed and unemployed respectively.

Majority of the mothers [$n = 232, 85\%$] were booked for antenatal contact. With regard to obstetric factors and history, 116 women [42.5%]

Table 1: Socio – demographic and obstetric variables of pregnant mothers with oligohydramnios after 37⁺⁰ weeks managed at Ayder Comprehensive specialized and Mekelle General Hospitals, from April 1, 2018 – March 31, 2019

Sociodemographic characteristics	Frequency (n=273)	Percent [95% CI]
Address		
Urban	240	87.9 [83.5, 91.3]
Rural	33	12.1 [8.7, 16.5]
Age (years), M=26.7, SD=4.7		
≤ 19	10	3.7 [2.0, 6.7]
20 - 34	244	89.4 [85.1, 92.5]
≥35	19	7.0 [4.5, 10.7]
Education status		
No formal education	19	7.0 [4.5, 10.7]
Elementary school	51	18.7 [14.5, 23.8]
Secondary school	106	38.8 [33.2, 44.8]
College or university	97	35.5 [30.1, 41.4]
Occupation		
Housewife	173	63.4 [57.5, 68.5]
Self employed	26	9.5 [6.6, 13.6]
Government employees	66	24.2 [19.4, 29.6]
Unemployed	8	2.9 [1.5, 5.8]
Marital status		
Married	270	98.9 [96.6, 99.7]
Single	3	1.1 [0.4, 3.4]
Obstetric characteristics		
Gravidity		
I	116	42.5 [36.7, 48.5]
II – IV	144	52.7 [46.8, 58.6]
≥V	13	4.8 [2.8, 8.1]
Gestational age		
Early term	68	24.9 [19.9, 30.5]
Full term	99	36.3 [30.6, 42.3]
Late term	54	19.8 [15.2, 25.0]
Post term	52	19.0 [14.6, 24.2]
ANC booking status		
Booked	232	85.0 [80.2, 88.8]
Not booked	41	15.0 [11.2, 19.8]
Previous history of abortion		
Yes	37	13.6 [10.0, 18.2]
No	236	86.4 [81.8, 90.0]
AFI		
<2	160	58.6 [52.6, 64.3]
≥ 2 – 5	113	41.4 [35.7, 47.4]

were primigravids, 144 [52.7%] were women with gravida II – IV, and women with gravida 5 and above accounted for only 13% [n = 4.8%]. The socio-demographic and obstetric profile of the study participants are shown in Table 1.

Perinatal outcome

In the present study, the rate of composite adverse perinatal outcomes was 29.7% (n = 81). (Table 2), The frequency of adverse perinatal outcomes in

Table 2: Adverse perinatal outcomes in pregnant mothers with oligohydramnios after 37⁺⁰ weeks treated at Ayder Comprehensive specialized and Mekelle General Hospitals, from April 1, 2018 – March 31, 2019

Variables	Frequency (n=273)	Percent [95% CI]
1st minute APGAR score		
<7	38	13.9 [10.3, 18.6]
≥7	235	86.1 [81.4, 89.7]
5th minute APGAR score		
<7	8	2.9 [1.5, 5.7]
≥7	265	97.1 [94.2, 98.5]
Birthweight in kilograms		
< 2.5	38	13.9 [10.3, 18.6]
≥2.5	235	86.1 [81.4, 89.7]
NICU Admission		
Yes	48	17.6 [13.5, 22.6]
No	225	82.4 [77.4, 86.5]
Meconium-stained amniotic fluid		
Yes	22	8.1 [5.4, 12.0]
No	251	91.9 [88.0, 94.7]
Perinatal death		
Yes	7	2.6 [1.2, 5.3]
No	266	97.4 [94.7, 98.8]
Composite adverse perinatal outcome		
Yes	81	29.7 [24.5, 35.4]
No	192	70.3 [64.6, 75.5]

Table 3: Determinants of adverse perinatal outcome in women with oligohydramnios after 37⁺⁰ weeks managed at Ayder Comprehensive specialized and Mekelle General Hospitals, from April 1, 2018 – March 31, 2019

Variable	Adverse perinatal outcome		Odds Ratio COR [95% CI]	p-value	AOR [95% CI]	p-value
	Yes	No				
Mode of delivery						
Vaginal	21 (25.0)	63 (75.0)	1			
Cesarean	60 (31.8)	129 (68.2)	1.4 [0.8, 2.5]	0.261		
AFI						
<2	52 (33.6)	103 (66.4)	1.5 [0.9, 2.6]	0.109	1.5 [0.8, 2.6]	0.174
2 – 5	29 (24.6)	89 (75.4)	1		1	
Age of participant						
≤19	2 (20.0)	8 (80.0)	0.6 [0.1, 2.7]	0.475		
24 – 34	75 (30.7)	169 (69.3)	1			
≥35	4 (21.1)	15 (78.9)	0.6 [0.2, 1.9]	0.380		
Gravidity at presentation						
Primigravida	46 (39.7)	70 (60.3)	2.3 [1.3, 3.9]	0.002	2.3 [1.3, 4.0]	0.003
Multigravida	35 (22.3)	122 (77.7)	1		1	
Gestational age						
Early term	26 (38.2)	42 (61.8)	1.9 [1.0, 3.8]	0.054	1.8 [0.9, 3.8]	0.083
Full term	24 (24.2)	75 (75.8)	1		1	
Late term	9 (16.7)	45 (83.3)	0.6 [0.3, 1.5]	0.279	0.6 [0.3, 1.5]	0.264
Post term	22 (42.3)	30 (57.7)	2.3 [1.1, 4.7]	0.023	2.4 [1.1, 5.1]	0.024
Labor circumstances						
No labor	38 (31.7)	82 (68.3)	1		1	
Spontaneous labor	22 (36.7)	38 (63.3)	1.2 [0.7, 2.4]	0.503	1.3 [0.6, 2.7]	0.448
Induced labor	21 (22.6)	72 (77.4)	0.6 [0.3, 1.2]	0.143	0.6 [0.3, 1.2]	0.130
ANC Booking						
Booked	73 (31.5)	159 (68.5)	1		1	

Not booked	8 (19.5)	33 (80.5)	0.5 [0.2, 1.2]	0.127	0.5 [0.2, 1.2]	0.126
Previous history of abortion						
Yes	69 (29.2)	167 (70.8)	1.2 [0.6, 2.4]	0.693		
No	12 (32.4)	25 (67.6)	1			

Hosmer-lemeshow test, $\chi^2(n=273, 10) = 1.78, p=0.987$, maximum VIF=1.29 Mean VIF=1.17

Table 4: Indications for CD in pregnant mothers with oligohydramnios after 37+0 weeks treated in Ayder comprehensive specialized and Mekelle general hospitals, from April 1, 2018 – April 31, 2019

Indications for cesarean delivery	Frequency	Percent [95% CI]
Oligohydramnios with unfavorable Bishop	61	32.3 [26.0, 39.3]
NRFHRS	43	22.8 [17.3, 29.3]
Oligohydramnios with IUGR	34	18.0 [13.1, 24.2]
Failed Induction	18	9.5 [6.1, 14.7]
Severe oligohydramnios with previous CD	11	5.8 [3.2, 10.2]
Oligohydramnios with malpresentation	10	5.3 [2.9, 9.6]
Fetal Macrosomia	6	3.2 [1.4, 6.9]
Poor progress of labor with thick mecon	3	1.6 [0.5, 4.8]
CPD	2	1.1 [0.3, 4.2]
APH secondary to placenta previa totalis	1	0.5 [0.1, 3.7]
Total	189	100.00

the study participants were; low first minute APGAR [n = 38, 13.9%], Low fifth minute APGAR Score [n=8, 2.9%], low birthweight [n = 38, 13.9%], NICU admission [n = 42, 15.4%], and thick meconium [n= 25, 9.2%]. Death of eleven babies [4%] was recorded in this study. There were 11 perinatal deaths in this study. Three died immediately after birth before referral to N – ICU. The remaining 8 died after admission to N – ICU. Forty-two neonates were admitted to N-ICU. The most common reasons for N – ICU admission were, perinatal asphyxia [n = 15, 35.7%], meconium aspiration syndrome [n = 8, 19.04%], early onset neonatal sepsis [n = 7, 16.7%] (Table 2).

In bivariate analysis of ANC booking, degree of oligohydramnios, gestational age at delivery, gravidity, and labor circumstances showed significant association with composite adverse perinatal outcome at P – value < 0.25. When these variables are computed into multivariable regression, only gravidity and gestational age at delivery were significantly associated with composite adverse perinatal outcome. The likelihood of experiencing adverse perinatal outcome was more than two-fold in primigravids as compared with multigravidas. Women at early and post term gestations were twice and four times odds of developing a composite perinatal outcome as compared to women at their full-term gestation, respectively. Women who had AFI <2 centimeters had 1.5x increased risk of

adverse perinatal outcome compared to those who had AFI 2-5 centimeters but this was not statistically significant (Table 3).

Maternal outcome

Majority of study participants, 189 (69.2%) delivered via cesarean delivery. The most common indication for cesarean delivery was oligohydramnios with unfavorable Bishop, followed by nonreasoning fetal heart rate status (NRFHRS), and oligohydramnios with IUGR (Table 4).

Discussion

Oligohydramnios is a relatively common obstetric complication whose presence demands an intensive antepartum and postpartum surveillance. The objective of the present study was to examine the prevalence and determinant factors of adverse perinatal outcome at the Mekelle Public Hospitals. In this study, the prevalence of oligohydramnios at term and across all gestations was 2.6% and 3.2% respectively. Close to a third of mothers sustained adverse perinatal outcome. The significant determinants of adverse perinatal outcomes were a primigravid and post term gestations at presentation, and an amniotic fluid volume of < 2 centimeters. Nearly 70% of mothers delivered via Cesarean section.

The prevalence of oligohydramnios across all viable gestations (3.2%) in the present study was in agreement with similar studies conducted in Ethiopia¹⁶, India¹¹, Nigeria²⁴, and Israel³⁶. To the contrary, the prevalence of oligohydramnios at term in the present study 2.6% (95% CI: 2.3%, 2.9%) was lower than the findings of a study in Uganda which depicted a prevalence of 9.4%³⁷. The prevalence of oligohydramnios can vary from one setting to another depending on the population of pregnant women being scanned. Teaching hospitals hosting a high-risk population tend to have a high prevalence of oligohydramnios.

Eighty-one mothers (29.7%, 95% CI: 24.5, 35.4) developed composite adverse perinatal outcome. This was higher than studies conducted in Israel which showed the prevalence of composite adverse outcome to be 9.7%³⁶. This can be attributed to the differences in set up. Although the study conducted by Eshawal *et al.* was conducted in a high resource setting, our study was conducted in an academic setting lacking intensive intrapartum monitoring modalities such as intrapartum electronic fetal monitoring with tracing and pattern interpretation. Compared with studies examining perinatal outcomes in low-risk mothers³⁸⁻⁴⁰ the present study, in agreement with a study conducted by Minwuye *et al.* in a similar set up in Ethiopia, reports significantly higher perinatal morbidity in terms of low birth weight, admission to the N-ICU, and thick meconium in labor in newborns of mothers complicated with oligohydramnios at term and post-term gestations¹⁶. Another study in a low- and middle-income countries also showed a similarly increased risk of perinatal death and low birth weight⁴¹. While primigravid low risk pregnant women have generally slightly increased risks of pregnancy complications as compared to their multigravida counterparts⁴², the two-fold increased adverse outcome in the present study reveals primigravity as a significant predictor of adverse perinatal outcome. Generally, babies born at early term gestation have an increased risk of perinatal adverse outcomes⁴³. However, the excessive adverse outcome revealed in the present study shows that oligohydramnios at early term gestation is related to adverse perinatal outcome. A perinatal adverse outcome in women who present after 42 completed weeks is twice – seven times higher than that of pregnancies who present at full term⁴⁴. Thus,

the twice increased risk of adverse outcome in the present study can be explained because of the inherent complications of post term pregnancy on perinatal outcome.

Concerning adverse maternal outcome, similar to rates in both developing and developed countries which showed high rates of CD ranging from 42.0 – 83.6%, this study revealed rates of CD to be nearly 70%^{11-13,16,24,30,39}. More revealing is that the most common indication was oligohydramnios with unfavorable Bishop (n = 60, 22%). This correlates well with a study done in India which describes isolated oligohydramnios as the commonest (24%) indication for CD for reasons of which they described lack of facilities for intrapartum monitoring and inadequate neonatal care which sounds similar to our set-up. Another study in Ethiopia also reports similar indications¹⁶. Due to intrapartum complication and high rate of perinatal morbidity and mortality associated with oligohydramnios, rates of caesarean section are rising, but decision between vaginal delivery and caesarean section should be well balanced so that unnecessary maternal morbidity is prevented and perinatal morbidity and mortality are reduced². Oligohydramnios tends to be associated with increased risk of Cesarean delivery particularly in low resource setting. This is owing to the perceived uncertainty of the intrapartum follow up and the increased rate of cesarean delivery in labor in those who are induced, there is a trend to lower a threshold to do elective cesarean delivery in cases of oligohydramnios. In agreement to a study conducted in China⁴⁵ the present study did not find an association between the mode of delivery and composite adverse perinatal outcome of pregnancies complicated with oligohydramnios. Although not statistically significant, congruent with a study elsewhere⁴⁶, severe oligohydramnios (AFI < 2 centimeters) was associated with a 1.5-fold increased risk of adverse perinatal outcome.

Ethical considerations

The proposal was approved by the Research and community service committee of Mekelle University, College of Health Sciences, on January

1, 2018 and ethical approval letter was obtained from the institutional review board. Furthermore, permission letters were obtained from the ACSH and MGH medical directors' offices. Written informed consent was obtained from all mothers who participated in this study.

Conclusion

This study helps to delineate the presence of which factors determine a composite adverse perinatal and maternal outcome. Context-specific appreciation of magnitude of the problem of oligohydramnios and factors related to poor outcome could help stratify the treatment of these mothers and can help to organize prompt interventions and mobilization of resources for resuscitation and early transfer to the NICU. This study concluded that women with oligohydramnios experience significantly higher morbidities in terms of composite adverse perinatal and maternal outcome. Primigravids and post term pregnancies were significant determinants of adverse neonatal outcome. A large proportion of women underwent cesarean delivery. Relative indications such as oligohydramnios with associated IUGR and oligohydramnios with an unfavorable Bishop score prevailed as the most common reasons for having Cesarean delivery. Neither labor induction nor the mode of delivery affects the perinatal outcome. We recommend increased surveillance to detect oligohydramnios among primigravid mothers and mothers at post-term gestation to promptly identify and institute timely interventions. To avoid the high rate of Cesarean delivery associated with oligohydramnios, decisions regarding the mode of delivery must be well balanced to avoid unnecessary major surgery on the one hand and instituting timely intervention to prevent adverse perinatal complications on the other.

Competing interests

The authors have declared that there are no competing interests.

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Availability of data

All the data set for this study are included in the main text.

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