Original Article

Feto-maternal Outcome in Third Trimester Oligohydramnios; A Prospective Cohort Study

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Abstract

Objectives: To determine the association of third trimester oligohydramnios with fetomaternal outcomes.
Methodology: Prospective Cohort Study was conducted in Department of Obstetrics and Gynaecology, Recep Tayyip Erdogan Hospital Muzaffargarh over one year from July 2022 to June 2023. A total of 176 women in their third trimester (28-40 weeks) of pregnancy were consecutively enrolled after informed consent. Based on ultrasound assessed amniotic-fluid index (AFI), participants were categorized as AFI <5 cm (oligohydramnios) or AFI ≥5 centimeter (normal). Maternal demographic, clinical, and nutritional factors were recorded. All participants were followed till delivery and fetomaternal outcomes including mode of delivery, birth weight, Apgar score, preterm birth, NICU admission and still births were recorded. Logistic regression through SPSS version 25 was used to determine association of oligohydramnios with fetomaternal outcome.
Results: Mean age of the pregnant women was 26.4 ± 5.0 years with mean age at marriage of 21.4 ± 3.8 years and mean marriage duration being 5.0 ± 4.4 years. The Cesarean-section occurred in 55.7% and preterm delivery in 22.7% of the participants. Compared to normal AFI, oligohydramnios was associated with higher cesarean rate (68.4% vs. 31.6%), preterm births (87.5% vs. 12.5%), NICU admission (97% vs. 3%), low birth weight (2.1 vs. 3.0 kg), and low Apgar score (7.2 vs. 8.0).
Conclusion: Women with oligohydramnios had significantly higher rate of cesarean section preterm deliveries, NICU admission, low birth weight, and lower Apgar scores compare to those without oligohydramnios.
Key Words: Oligohydramnios, Malnutrition, Hypertension, Premature birth, Low birth weight

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Introduction

In order to provide for the needs of the fetus for its life and growth in a sterile environment, management of temperature, avoidance of external harm, and decrease of the influence of uterine contractions, nature created floating beds in the shape of amniotic fluid cavities filled with liquor.[1] Throughout the gestational stage, the fetus is surrounded by amniotic fluid. It has bacteriostatic properties.[1] Deficient amniotic fluid in pregnancy is known as Oligohydramnios. An AFI <5cm is considered as oligohydramnios.[2]

Incidence of Oligohydramnios is about I -5% of total pregnancies.[3] The causes of oligohydramnios include repetitive cord compression, Fetal anomalies like renal agenesis, posterior urethral valves, abnormalities of brain, lung hypoplasia, post-date gestation, preterm rupture of membranes, intrauterine growth failure, intrauterine death, abruptio-placenta, hypertension, and pregnancy induced hypertension.[4] Therefore, decreasing amniotic fluid volume as a result of decreased fetal kidney urine output is an indication of chronic hypoperfusion in fetus.[5]

Oligohydramnios, resulting from reduced amniotic fluid production or increased fluid loss, compromises the intrauterine environment and placental perfusion, leading to chronic fetal hypoxia and growth restriction.[5] The diminished fluid volume adversely affects maternal and fetal health by increasing the risk of cord compression, fetal distress, meconium aspiration, low Apgar scores, need for admission in neonatal intensive care unit (NICU), maternal depression and perinatal morbidity or mortality.[6] Isolated oligohydramnios is linked to a higher risk of iatrogenic premature birth and relatively smaller birth weights.[7] Additionally, oligohydramnios is linked to higher rates of induction

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and/or surgical intervention, which contribute to maternal morbidity.[8]

In 2020 a prospective study by Figueroa L et al, 12,940 pregnant women were studied who underwent sonographic examination in 3rd trimester. Oligohydramnios was present in 87 (0.7%) cases. There was high rate of C-section (28.7% vs. 13.5%), still birth (8% vs. 1.5%), preterm births (31.8% vs. 1 1.4%) and low birth weight babies (LBW - 29.9% vs. 1 1.7%) in mothers with oligohydramnios compared to women without oligohydramnios.[9]

To prevent serious fetal outcomes and long-term admissions of babies, early decisions of cesarean section can be done. Early identification and management of oligohydramnios will reduce neonatal morbidity and mortality. Our study will help in defining thresholds for referral to higher-level care centers, especially in low-resource or rural settings. It will also emphasize the need to train physicians, midwives, and sonographers to detect and monitor amniotic fluid levels reliably. While oligohydramnios has been widely studied internationally, no study has been reported from Muzaffargarh, a local region of South Punjab where maternal nutrition, antenatal care access, and obstetric practices differ significantly from urban tertiary settings. Existing studies show inconsistent criteria for oligohydramnios (e.g., AFI <5 cm vs. single deepest pocket <2 cm) and mixed outcome measures, making it difficult to apply results to local obstetric populations. With increasing antenatal ultrasound availability in district-level hospitals, newer data are needed to re-evaluate how oligohydramnios correlates with outcomes under current clinical protocols. Updated local data will support obstetric guidelines and resource allocation for high-risk pregnancy surveillance in South Punjab.

We hypothesized that women with oligohydramnios have poor fetomaternal outcomes compared to women with normal amniotic fluid index.

Methodology

This prospective cohort study was conducted at Department of Obstetrics & Gynaecology Recep Tayyip Erdogan Hospital over a period of one year from July 2022 to June 2023 after approval from the institutional ethics review committee (ERC# 74/PHY/DGKMC, dated: 28-04-2021). A total of 176 women in third trimester (28 – 40 weeks of gestation) of pregnancy, presenting to outpatient department and willing to deliver at study center were consecutively enrolled after informed consent. Women with rupture of membranes and multiple pregnancies were excluded from the study. A minimum sample size of 176 was calculated assuming 11.7% low birthweight in women without oligohydramnios and 29.9% in women with oligohydramnios at 80% power of the study and 5% significance level.[7]

After detailed history and examination all women underwent ultrasound examination by consultant radiologist for the measurement of amniotic fluid index (AFI). Based on AFI women were categorized as AFI ≥ 5cm (unexposed, n=88) and AFI < 5cm (exposed, n=88). Women age, duration of marriage, age at the time of marriage, parity, chronic hypertension, Diabetes mellitus and malnutrition were noted. All women were followed fortnightly in outpatient department to assess the fetal growth and when needed doppler studies for fetal compromise were conducted. All deliveries were performed at study center and neonates were attended by neonatologists. The outcome variables like mode of delivery (spontaneous vaginal delivery/ Caesarean section/induction of labour), infant birth weight (kg), APGAR score, neonatal intensive care unit admissions, and any stillbirths were recorded.

Data was analysed through SPSS version 25. Descriptive statistics in the form of mean ± standard deviation for numerical data and frequency and percentages for categorical data are reported. Factors associated with poor fetomaternal outcomes between low and normal amniotic fluid index were assessed through logistic regression analysis. Factors with a p-value of < 0.20 at bivariate analysis were entered into stepwise forward multivariable model. Crude and adjusted odds ratios with 95% confidence interval for low amniotic fluid index and relative risk for fetomaternal outcomes are reported and p-value of < 0.05 was considered significant for independent predictors of these outcomes.

Results

Mean age of the pregnant women was 26.4 ± 5.0 years with mean age at marriage of 21.4 ± 3.8 years and mean marriage duration being 5.0 ± 4.4 years. The mean parity was 1.5 ± 1.6 with 58.5% ≤ 1 para. Maternal chronic hypertension, diabetes and malnutrition were present in 22.2% (n=39), 1.7% (n=3) and 14.2% (n=25) respectively. Maternal age, age at marriage, duration of marriage and diabetes were comparable between oligohydramnios and no-

oligohydramnios groups. Compared to no-oligohydramnios, women with oligohydramnios have significantly higher frequency of chronic hypertension (74.4% vs. 25.6%) and malnutrition (88% vs. 12.0%). The independent predictors of oligohydramnios were parity ≤ 1 [adjusted odds ratio – aOR: 2.6 (1.3 – 5.4)], malnutrition [aOR 16.6 (4.4 – 62.7)] and chronic hypertension [aOR 5.4 (2.3 – 12.8)] (Table I).

In 55.7% (n=98) women delivery was done through cesarean section and induction of labour was need in 23.2% (n=41) cases. Still birth was documented in 2.3% (n=4) cases and preterm deliveries occurred in 22.7% (n=40) of the women. The mean birth weight was 3.8 ± 2.5 kg and mean Apgar score being 7.6 ± 1.2. Neonates required NICU admission in 19% (n=33) of the cases. Induction of labour and still birth were comparable between oligohydramnios and no-oligohydramnios groups. Compared to women without oligohydramnios, women with oligohydramnios had significantly higher rate of cesarean section (68.4% vs. 31.6%), preterm deliveries (87.5% vs. 12.5%), NICU admission (97% vs. 3%), low birth weight (2.1 ± 0.40 vs. 3.0 ± 0.30 kg) and lower Apgar score (7.2 ± 1.6 vs. 8.0 ± 0.2) (Table II).

Table III: Independent predictors of maternal outcomes in study participants. (N=176)

Predictors	Adjusted Relative Risk (95% CI)	p-value*
Cesarean Section		
Oligohydramnios	5.2 (2.6 – 10.5)	< 0.001
Chronic hypertension	5.5 (1.9 – 15.5)	0.001
Marriage ≥ 5-years	2.1 (1.0 – 4.1)	0.045
Induction of Labour		
Marriage at > 20-years	2.4 (1.1 – 5.2)	0.025
Preterm Delivery		
Oligohydramnios	8.8 (2.8 – 27.5)	< 0.001
Diabetes Mellitus	28.4 (1.6 – 493.4)	0.022
Chronic hypertension	3.0 (1.2 – 7.4)	0.016
Malnourished	2.8 (1.0 – 7.7)	0.043

**Wald test*

Three independent predictors of cesarean section were oligohydramnios [relative risk 5.2 (2.6 – 10.5)], chronic hypertension [relative risk 5.5 (1.9 – 15.5)] and marriage duration of ≥ 5-years [relative risk 2.1 (1.0 – 4.1)]. Marriage above 20-years of age was only independent predictor of labour induction [relative risk 2.4 (1.1 – 5.2)]. The independent predictors of preterm deliveries were oligohydramnios [relative risk 8.8 (2.8 –

Table I: Baseline characteristics of study participants. (N=176)

Characteristics	All (N=176)	AFI < 5cm (n=88)	AFI ≥ 5cm (n=88)	p-value*
Maternal Age (years)	26.4 ± 5.0	25.8 ± 4.9	27.0 ± 5.0	0.105
Age at marriage (years)	21.4 ± 3.8	20.9 ± 3.9	21.9 ± 3.7	0.075
Duration of marriage (years)	5.0 ± 4.4	4.9 ± 4.3	5.1 ± 4.4	0.711
Parity	1.5 ± 1.6	1.3 ± 1.6	1.7 ± 1.6	0.191
Chronic Hypertension (yes)	39 (22.2)	29 (74.4)	10 (25.6)	0.001
Maternal Diabetes (yes)	03 (1.7)	1 (33.3)	2 (66.7)	1.00
Malnourished mother (yes)	25 (14.2)	22 (88)	03 (12)	< 0.001
Independent Predictors of Oligohydramnios				
Predictors	**Adjusted odds ratio (95% CI)**			**p-value**
Parity ≤ 1	2.6 (1.3 – 5.4)			0.009
Malnourished	16.6 (4.4 – 62.7)			< 0.001
Chronic Hypertension	5.4 (2.3 – 12.8)			< 0.001

***AFI:** Amniotic fluid index, * Independent sample t-test for numerical data, chi-square test for categorical (Fischer's exact test where cell count <5)*

Table II: Feto-maternal outcomes in study participants (N=176)

Characteristics	All (N=176)	AFI < 5cm (n=88)	AFI ≥ 5cm (n=88)	p-value*
Mode of delivery				< 0.001
Cesarean section	98 (55.7)	67 (68.4)	31 (31.6)	
Vaginal delivery	78 (44.3)	21 (26.9)	57 (73.1)	
Induction of labor (yes)	41 (23.2)	24 (58.5)	17 (41.5)	0.212
Preterm delivery (yes)	40 (22.7)	35 (87.5)	5 (12.5)	< 0.001
Still birth (yes)	4 (2.3)	4 (100)	00 (00)	.121
Birth weight (kg)	3.8 ± 2.5	2.1 ± 0.40	3.0 ± 0.30	< 0.001
Apgar score	7.6 ± 1.2	7.2 ± 1.6	8.0 ± 0.2	< 0.001
NICU admission (yes)	33 (19)	32 (97)	1 (3)	< 0.001

***AFI:** Amniotic fluid index, * Independent sample t-test for numerical data, chi-square test for categorical (Fischer's exact test where cell count <5)*

Table IV: Independent predictors of fetal outcomes in study participants. (N=176)		
Predictors	**Adjusted Relative Risk (95% CI)**	**p-value***
Low birth weight		
Oligohydramnios	609 (76.8 – 4826.0)	< 0.001
Low Apgar score		
Oligohydramnios	38.2 (5.1 – 289.2)	< 0.001
NICU Admission		
Oligohydramnios	40.9 (5.4 – 310.9)	< 0.001
Hypertension	3.1 (1.3 – 7.7)	0.014

27.5)], diabetes mellitus [relative risk 28.4 (1.6 – 493.4)], chronic hypertension [relative risk 3.0 (1.2 – 7.4)] and malnutrition [relative risk 2.8 (1.0 – 7.7)] (Table III).

Oligohydramnios was independent predictor of low birth weight [relative risk 609 (76.8 – 4826.0)], low Apgar score [relative risk 38.2 (5.1 – 289.2)] and NICU admission [relative risk 40.9 (5.4 – 310.9)]. Maternal chronic hypertension was the additional independent predictor of NICU admission [relative risk 3.1 (1.3 – 7.7)] (Table IV).

Discussion

The association between oligohydramnios and high-risk adverse perinatal outcomes is well established. However, negative effects are not accurately predicted by oligohydramnios. Oligohydramnios, on the other hand, is considered an indication of delivery.[10] The assessment of amniotic fluid volume throughout the antenatal period is a helpful method to identify women who are at risk to develop poor postnatal outcomes.[11]

In our study, maternal age, age at marriage and diabetes were comparable between women with and without third trimester oligohydramnios. In Tanzania, Kibona UT et al studied women with and without oligohydramnios. Maternal age did not significantly differ between affected and unaffected women, but they did report a strong correlation between gestational diabetes, pre-eclampsia, eclampsia and the incidence of oligohydramnios.[12] This agrees with our findings.

One hundred and nine pregnant women participated in a retrospective cohort study conducted by Batool et al, at a tertiary care hospital in Pakistan. Similar to our findings, the study pointed out that maternal age (mean age 29.8 years) was comparable in women with and without oligohydramnios. Also, they found no relationship between amniotic fluid levels and diabetes which is consistent with our results.[13] Despite diabetes being linked to various pregnancy complications, its direct effect on amniotic fluid volume was minimal especially when blood glucose levels were well controlled.

According to our research, women with oligohydramnios had significantly higher levels of maternal chronic hypertension and malnourishment. According to a cross-sectional study from Duhok Maternity Teaching Hospital, maternal hypertension was considerably greater (7%) in women with oligohydramnios than in the general population, confirming hypertension as a major risk factor.[4] The consistent association across both studies reinforces the role of hypertensive disorders in compromising uteroplacental circulation, leading to reduced amniotic fluid volume.

According to a 2025 observational study, the most frequent maternal consequence among women with oligohydramnios was pregnancy-induced hypertension (25.3%). The relationship between low amniotic fluid and hypertensive disease was well established, even though malnutrition was not evaluated.[14]

Researchers discovered that maternal undernutrition significantly raised the incidence of hypertensive disorders during pregnancy (aRR = 4.07), which is known to contribute to decreased amniotic fluid volume, in a prospective cohort of Ethiopian pregnant women. Although the study did not report oligohydramnios directly, the findings are highly relevant to our observation showing higher rates of malnourishment in women with oligohydramnios due to the clear relationship through hypertension, which is frequently related with low amniotic fluid.[15]

A significant prevalence (25%) of amniotic fluid volume abnormalities including oligohydramnios, was found in a multi-country analysis involving Guatemala, Pakistan, and Zambia. Significant predictors of fluid imbalance were shown to be maternal nutritional status and associated health conditions, including hyperemesis gravidarum, which frequently results in nutritional imbalance. These findings reinforce the association observed in our research and support the theory that malnutrition has a role in decreasing the amniotic fluid.[9]

We observed that compared to women without oligohydramnios, women with oligohydramnios had significantly higher rate of cesarean section, preterm deliveries, NICU admission, low birth weight and lower Apgar score. The oligohydramnios group exhibited significantly higher rates of low birth weight (34%) and 1 min Apgar < 7 (18%) and NICU admission (22%) compared to the normal AFI arm in a prospective

cohort that stratified 420 uncomplicated pregnancies by amniotic fluid index. This was in line with the higher rates of LBW, poor Apgar scores, and NICU admissions that we observed.[16] Our data, which showed a relevance of malnourished, hypertensive women with oligohydramnios, is consistent with the given findings. Persistent uteroplacental hypoperfusion results in fetal growth limitation and intrapartum adverse consequences.

Two hundred women undergoing labor having oligohydramnios reported 47 percent cesarean delivery, 46 percent preterm birth, 59 percent NICU hospitalization, and 28 percent LBW, in a cross-sectional study. All characteristics support the overall risk profile while suggesting that timely newborn resuscitation and tertiary care logistics can prevent Apgar deterioration. Logistic analysis associated oligohydramnios with a 1.7-fold increase in cesarean sections and an earlier gestational age at delivery as compared to low-risk controls in a high-risk term group (n = 1,114).[18]

Compared to women with normal fluid, the subgroup with oligohydramnios had significantly higher rates of pre-term birth, LSCS, NICU admission, and low Apgar scores among 743 pre-eclamptic pregnancies in Turkish research.[19] These findings demonstrate that newborn impairment increases when uteroplacental insufficiency is added to fluid depletion, which may be one explanation for why our malnourished, hypertensive mothers displayed the entire set of negative outcomes.

A two-year cross-sectional study (n = 188) found that 69 percent of deliveries were cesarean, 53 percent were LBW, 30 percent had 1 min Apgar ≤ 7, and 14 percent were admitted to the NICU.[20] Although their high rates of LBW and cesarean sections are consistent with our findings, their relatively low NICU admissions might be due to regional admission thresholds; on the other hand, their higher Apgar impairment might be the consequence of insufficient intrapartum monitoring, highlighting the ways in which institutional protocols influence subsequent neonatal parameters. Generally, oligohydramnios has been demonstrated to be a clinical sign of impending severe perinatal disability. These results confirm that although oligohydramnios is a strong warning flag, its expression during pregnancy can be changed by early identification, dietary intervention, rigorous hypertension management, and protocol-driven intrapartum monitoring.

Our study had a few limitations. First, only 176 participants from a single tertiary hospital, were included. Statistical power is limited by the small sample size and single geographic setting, as evidenced by the wide confidence intervals. Despite the use of multivariable logistic regression, the associations between oligohydramnios and unfavourable outcomes may still be affected by unmeasured variables including smoking, subclinical infection, placental pathology, or socioeconomic status.

Conclusion

We conclude that there is significant association between oligohydramnios and fetal-maternal outcomes. Adverse feto-maternal outcomes, such as increased rates of cesarean sections, premature deliveries, low baby weight, worse Apgar scores, and NICU admissions, were significantly associated with oligohydramnios. To confirm these results, larger, multi-center studies with serial AFI monitoring and thorough maternal nutritional assessment are advised.

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