

ORIGINAL ARTICLE

Clinical and Sonological Evaluation of Borderline Amniotic Fluid Index and Oligohydramnios-Its Correlation with Perinatal Outcomes

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ABSTRACT

Objective: To evaluate the correlation of low borderline amniotic fluid index and oligohydramnios with perinatal outcomes among pregnant females presenting at the tertiary care hospital of Karachi.

Study Design: Cross-sectional study.

Place and Duration of Study: The study was conducted at the Department of Obstetrics and Gynecology, Hamdard University, Karachi, Pakistan, from March 2021 to March 2022.

Methods: Females aged 18-45 years, with a gestational age of 20-42 weeks assessed on the last menstrual period and a single fetus on ultrasound were enrolled. The final sample size for the study was determined to be 260 with 130 participants in each group, i.e., the females with Amniotic Fluid Value (AFI) value of ≤ 5 cm considered as oligohydramnios (group-1) and AFI value of 5.1 to 8 cm considered as borderline AFI (group-2). The amniotic fluid index value was determined in all the females using ultrasonographic reports by the consultant physicians. Females were classified as having oligohydramnios if their amniotic fluid index value was less than 5 cm and borderline amniotic fluid index between 5.1 and 8 cm. To evaluate the maternal and perinatal outcomes, all females were monitored up to birth. Data was analyzed using SPSS version 23.

Results: The mean maternal age was 29.85 ± 5.45 years, and the mean BMI was 29.78 ± 5.62 kg/m². Most of the females had gravida ≥ 1 . Females with oligohydramnios had higher rates of low birth weight (84.6% vs. 51.5%, $p=0.001$), IUGR (68.5% vs. 22.3%, $p=0.001$), meconium staining (42.3% vs 7.7%, $p=0.001$), low APGAR score (50.8% vs. 13.8%, $p=0.001$), respiratory distress syndrome (72.3% vs 27.7%, $p=0.001$), birth asphyxia (65.4% vs 23.1%, $p=0.001$), NICU admission (73.8% vs. 43.1%, $p=0.001$), and neonatal death (21.5% vs. 5.4%, $p=0.001$) than women with borderline amniotic fluid index.

Conclusion: This observational study demonstrates a significant correlation between oligohydramnios and adverse perinatal outcomes, emphasizing the importance of vigilant monitoring and intervention in pregnancies with low amniotic fluid.

Key Words: Amniotic Fluid Index, Oligohydramnios, Perinatal Mortality, Pregnancy.

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Introduction

Oligohydramnios is defined as an amniotic fluid index (AFI) of less than and equal to 5 cm or a single deepest pocket of less than and equal to 2 cm, which is thought to be a strong indicator of a number of adverse perinatal outcomes, such as a lower Apgar score, intrauterine growth restriction (IUGR), fetal labour intolerance, fetal intolerance to caesarean delivery, meconium passage, admission to neonatal intensive care unit (NICU), congenital abnormalities, fetal heart rate abnormality, and neonatal or fetal death.^{1,2} "The American College of Obstetricians and

Gynecologists (ACOG)" recommended intensified surveillance when ultrasonography finds oligohydramnios in the 2nd or 3rd trimester due to the significant risk of perinatal severe consequences.³

In the early 3rd trimester, the amniotic fluid volume is sufficient and afterward declines before term. AFI value of 8 cm below the 5th percentile for gestational age before 34 weeks is considered as abnormal AFI. AFI >5 cm and <8 cm is called "borderline AFI".^{4,5} Potential risk linked to borderline AFI is not fully understood during the preterm period.⁶ Recent studies found that pregnant women with borderline AFI was at higher odds of low birth weight, pre-term birth, and fetal distress.⁷ Whereas, in another study conducted in Pakistan showed an insignificant difference in poor perinatal outcomes among females with borderline and normal AFI value, but oligohydramnios was highly correlated with meconium aspiration, birth asphyxia, low APGAR score and caesarean section for fetal distress.⁸

Few studies on borderline AFI and its related perinatal threat are available in Pakistan. Thus, the current study aimed to assess the correlation of borderline AFI and oligohydramnios with perinatal outcomes in the local context. This study would highlight the significance of early identification and management of AFI to reduce neonatal morbidity and death as well as maternal complications.

Methods

This observational study was carried out at the Obstetrics and Gynecology Department of Hamdard University, Karachi, Pakistan, from March 2021 to March 2022. Graph Pad calculator was used to estimate sample size by taking statistics of low APGAR score in females with oligohydramnios as 14% and in normal AFI as 4%, power of test 80% and 95% confidence level. The estimated sample is 130 in each group; total sample size was 260.⁹ Females of age 18-45 years, with a gestational age of 20-42 weeks assessed on the last menstrual period (LMP) and with single fetus on ultrasound were included in the study. Females with fetal anomalies, premature rupture of membranes, multiple pregnancies, and malpresentation were excluded from the study. A non-random consecutive sampling method was employed. The study was conducted after approval from the university's ethical review committee held

on 3rd March 2021 vide letter no: HCM&D/1670/2021. Written informed consent was taken from all the eligible patients before enrollment in the study. The AFI value was determined in all the females using ultrasonographic report by the consultant physicians. The females with AFI value of ≤ 5 cm was considered as oligohydramnios (group 1) and AFI value of 5.1 to 8 cm was considered as borderline AFI (group 2). Females in both groups were followed up till delivery to evaluate the outcomes. Maternal outcomes included pre-term birth (regular contractions result in the opening cervix after 20 and before 37 weeks of pregnancy) and mode of delivery (vaginal delivery or c-section). Perinatal outcomes were low birth weight (The weight of the fetus less than 2500 grams), low APGAR score (Score of less than seven at 5 minutes), intrauterine growth restriction (IUGR) [a sonographic estimated fetal weight <10th percentile], meconium staining, birth asphyxia (If the baby had difficulty in breathing, inability to breathe, developing a blueish tint to the skin, irregular heart rate, weakness, and seizure), respiratory distress syndrome (If the baby needed extra oxygen after birth), neonatal intensive-care unit (NICU) admission, and neonatal death (death of neonate during delivery or within 4 weeks of delivery). The researcher herself noted information regarding socio-demographics and medical history on the pre-designed proforma.

Data was analyzed using SPSS version 23. Qualitative variables were presented as frequency and percentage, such as gravidity, parity, residence, socio-economic status, mother's education, ethnicity, medical history, and maternal and perinatal outcomes. Quantitative data like maternal and gestational age and BMI were presented as mean and standard deviation (SD). Pearson's chi-square (χ^2) test was employed to check for associations between categorical and outcome variables. The level of significance was taken as 5%.

Results

The mean maternal age was 29.85 ± 5.45 years, and most females had gravida and parity ≥ 1 . The most common medical history was pre-eclampsia (30%). Other demographic characteristics and medical history are displayed in Table 1.

Table 1: Baseline Characteristics and Medical History of Participants (n=260)

Variables	Mean±SD
Age (years)	29.85±5.45
BMI (kg/m ²)	29.78±5.62
Gestational age at delivery (weeks)	33.60±4.16
Gravida	n (%)
0	46 (17.7)
1-2	49 (18.8)
>2	165 (63.5)
Parity	n (%)
0	68 (26.2)
1-2	157 (60.4)
>2	35 (13.5)
Residence	n (%)
Urban	193 (74.2)
Rural	67 (25.8)
Socio-economic status	n (%)
Low	53 (20.4)
Middle	161 (61.9)
High	46 (17.7)
Mother's education	n (%)
Illiterate	38 (14.6)
Primary	65 (25)
Secondary	82 (31.5)
Higher secondary	11 (4.2)
Graduate	64 (24.6)
Ethnicity	n (%)
Sindhi	88 (33.8)
Punjabi	97 (37.3)
Urdu speaking	57 (21.9)
Balochi	13 (5)
Pashto	5 (1.9)
Medical history	n (%)
Diabetes	17 (6.5)
Hypertension	42 (16.2)
Pre-eclampsia	78 (30)
Gestational diabetes	14 (5.4)

The proportion of pre-term labor was significantly greater in borderline AFI than oligohydramnios (79.2% vs 48.5%) with p -value=0.001. Meanwhile, the proportion of c-sections was considerably

greater in oligohydramnios as compared to borderline AFI (70.8% vs 16.9%) with p -value=0.001. (Table 2).

The proportions of perinatal outcomes such as low

Table 2: Maternal outcomes with AFI measurements (n=260)

Maternal outcomes	Oligohydramnios (n=130)	Borderline AFI (n=130)	p -value
Pre-term labor	n (%)	n (%)	
Yes	63 (48.5%)	103 (79.2%)	0.001*
No	67 (51.5%)	27 (20.8%)	
Mode of delivery	n (%)	n (%)	
C-section	92 (70.8%)	22 (16.9%)	0.001*
Vaginal delivery	38 (29.2%)	108 (83.1%)	

birth weight (84.6% vs. 51.5%, $p=0.001$), IUGR (68.5% vs 22.3%, $p=0.001$), meconium staining (42.3% vs. 7.7%, $p=0.001$), low APGAR score (50.8% vs. 13.8%, $p=0.001$), respiratory distress syndrome (72.3% vs. 27.7%, $p=0.001$), NICU admission (73.8% vs. 43.1%, $p=0.001$), birth asphyxia (65.4% vs. 23.1%,

$p=0.001$), and neonatal mortality (21.5% vs. 5.4%, $p=0.001$) were comparatively greater in females with oligohydramnios than borderline AFI. (Table 3).

Discussion

The assessment of AFI is an essential tool for identifying females who are more likely to

Table 3: Correlation of perinatal outcomes with AFI measurements (n=260)

Perinatal outcomes	Oligohydramnios (n=130) n (%)	Borderline AFI (n=130) n (%)
Low birth weight	110 (84.6)	67 (51.5)
IUGR	89 (68.5)	29 (22.3)
Meconium staining	55 (42.3)	10 (7.7)
Apgar score<7 at 5 mins	66 (50.8)	18 (13.8)
Respiratory distress syndrome	94 (72.3)	36 (27.7)
Birth asphyxia	85 (65.4)	30 (23.1)
NICU admission	96 (73.8)	56 (43.1)
Neonatal death	28 (21.5)	7 (5.4)

experience unfavorable perinatal outcomes.¹⁰⁻¹³

Numerous researches has been conducted to assess the relationship between borderline AFI and perinatal outcomes. In majority of the studies, the incidence rate of fetomaternal outcomes was greater in females with borderline AFI than in normal AFI.¹⁴⁻¹⁷ A new development is the use of borderline oligohydramnios as a prediction of chronic hypoxia and normal AFI as a predictor of fetal status with a healthy placenta.¹⁸

In the current study, the mean age of the females was 29.85±5.45 years. Sultana et al. conducted a similar Pakistani research and found almost the same mean maternal age as our result i.e. 30±6.2 years.¹⁹ Similarly, Talpur et al. reported the average age as 30±3.1 years and majority of the females were multipara (46%) followed by primipara (38%).¹⁵ In another study by Farid et al. also reported similar maternal age as 30.11 ±5.93 years and most of the females had >1 parity and gravida.¹⁶ Moreover, the frequent high-risk condition in our females was preeclampsia which required early delivery is some females. This is not rare as most of the females had 1 to 2 parity and gravida in the present study, which is usually correlated with hypertension during pregnancy.¹⁷ Similar findings have been reported by other researchers as well.^{19,20}

In the current study, we discovered that borderline AFI had a greater rate of pre-term labour than oligohydramnios, whereas oligohydramnios had a

higher rate of C-sections. Similarly, Vyas et al. found that pre-term delivery and C-section were more in females with borderline AFI than females with normal AFI.²¹ Pardip et al. and Talpur et al. also revealed that the proportion of C-section was higher in females with low AFI than normal AFI.^{15,20} While, Sultana et al. found similar C-section rates in females with low AFI and normal AFI.¹⁹ In another Pakistani study by Islam et al. the rate of C-section was higher in low AFI<5 cm than normal AFI.²² Furthermore, in the current study, the rate of adverse perinatal outcomes was higher in females with oligohydramnios than borderline AFI. In the study, Vyas et al. also showed greater proportion of perinatal outcomes like low birth weight, low APGAR score, IUGR, respiratory distress syndrome, and NICU admission in borderline AFI than the control group.²¹ In another recent study by Kalambe et al., C-section, low birth weight, and NICU admission were correlated with oligohydramnios.²³ Chiniwar et al. also found a higher proportion of C-section delivery, low birth weight, NICU admission and perinatal deaths in females with oligohydramnios as compared to controls.²⁴ Recently, a large study conducted among 12,940 females from low-income countries (i.e., DRC, Zambia, Guatemala, and Pakistan) revealed higher rates of cesarean delivery, stillbirths, neonatal deaths <28 days, low birth weight, and pre-term births in females with oligohydramnios than women without

oligohydramnios.¹⁰ Hence, these findings suggested that timely identification of low AFI is needed at antenatal visits to prevent perinatal morbidity and death.^{15,25}

Few limitations of our study included a small sample size and samples from the single institute, so the findings cannot be generalized for the whole population. More studies with larger sample sizes based on multi-center samples should be conducted.

Conclusion

This observational study demonstrates a significant correlation between oligohydramnios and adverse perinatal outcomes, emphasizing the importance of vigilant monitoring and intervention in pregnancies with low amniotic fluid.

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Authors Contribution

SJ: Idea conception, study designing, data collection, manuscript writing and proof reading

KA: Study designing, data analysis, results and interpretation, manuscript writing and proof reading

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