

Effect of decreased amniotic fluid index on fetomaternal outcome

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Abstract:

Objectives: Decrease of amniotic fluid is associated with adverse perinatal outcomes. Objective of this study is to evaluate fetomaternal outcomes among mothers with decreased amniotic fluid index (oligohydramnios).

Material and Methods: This cross-sectional observational study using non-probability consecutive sampling technique was carried out on pregnant mothers in-between 18-35 years of age having gestational age >24 months (with AFI of 5 cm or below) at the Department of Obstetrics and Gynecology of Zia Uddin University Hospital, Karachi (North Nazimabad campus) for a period of six months from 1st October 2019 till 31st March, 2020. Mothers with pregnancy induced hypertension, pre-eclampsia, eclampsia, essential hypertension, renal disease or diabetes mellitus, known fetal anomaly and lost to follow up were excluded. SPSS version 20 was used for data analysis. Chi-square test was applied to test significance between complications with decreased AFI and mode of delivery, keeping p-value <0.05 as significant.

Results: From 250 pregnant mothers with mean age 25.94 ± 4.52 years, 199 (79.6%) booked case and 232 (92.8%) housewives. Spontaneous vaginal delivery was observed in 58 (23.2%), EMLSCS 93 (37.2%) and ELSCS 74 (29.6%). Fetal distress in 25 (26.8%) and low birth weight of <2.5 kg in 91 (36.4%) were most frequent maternal and perinatal complications. Apgar score <6 at 1 min was seen in 100 (40%) neonates at 5 min in 22 (8.8%). NICU admission was reported in 109 (43.6%). Significant difference of 0.017 was observed regarding association between complications and mode of delivery

Conclusion: Risk for adverse maternal and fetal outcomes increased when amniotic fluid index decreased to below 5. Significant association was observed in terms of the complications due to AFI <5 and mode of delivery.

Keywords: Low amniotic fluid, fetomaternal outcomes, pregnancy-related complications, growth restriction, oligohydramnios, ELSCS (Elective caesarean section)

Introduction:

Amniotic fluid, commonly termed as a pregnant mother's water is known to be a protective liquid which is contained within amniotic sac in pregnant woman.¹ The function of amniotic fluid is to protect the developing fetus through cushioning from forces applied on a mother's lower abdomen, thus allow easy movement of fetus as well as promote development of the skeletal or muscular system.² Swallowing of amniotic fluid by the developing fetus helps in formation of the fetus's gastrointestinal tract. Not only this but

amniotic fluid also aids in preventing mechanical shocks and jerks to the fetus.³

The composition of amniotic fluid changes with fetal gestational age.⁴ Initially the fluid mainly comprises of water along with electrolytes, however by between the 12th and 14th week of gestation, amniotic fluid constitutes a mixture of carbohydrates, proteins, lipids, urea and phospholipids. Each constituent helps in the growth and development of the fetus.⁵ Along with varying composition of amniotic fluid, the volume

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also varies with increasing gestational age. For instance, the volume of gestational age remains about 200 ml at week 16, and then increasing to about 1000 ml by week 28, then decreased to 900 ml at week 36 and 800 ml by week 40 of gestation.⁶

A good and thorough clinical or ultrasonography examination by clinician can demonstrate and detect mothers have abnormal volume of liquor, which can be confirmed by ultrasound examination.⁷ According to the defined liquor assessment of amniotic fluid index (AFI) below 5cm is regarded as oligo-hydramnios, while and AFI in-between 5-8cm is considered borderline AFI.⁸ Ante-partum oligo-hydramnios has been linked to increases in malformation of fetus while in absence of malformation, become complicated into growth restriction of fetus followed by adverse peri-natal outcome as well as maternal morbidity.⁹ The most frequent cause of oligo-hydramnios is reported to be the pre-labor rupture of membranes.¹⁰

Therefore each case of oligo-hydramnios must be carefully and completely be evaluated antenatal along with counselling of parents with individual provision with regards to the mode and time of delivery along with continuously monitoring of fetus intra-partum and providing adequate neonatal care for optimal perinatal outcome.^{11,12}

The cause of oligo-hydramnios, management and outcomes differs in late oligo-hydramnios as compared to early oligo-hydramnios. Since amniotic fluid is regarded as a marker of fetal well-being and both increase of decrease of amniotic fluid has been associated with various adverse perinatal outcomes like congenital anomalies, meconium staining, intra-uterine growth restriction, fetal hypoxia and prematurity, all of which have been linked to oligo-hydramnios.¹³

The purpose of this study is to evaluate the fetal and maternal outcomes among mothers with decreased amniotic fluid index (oligo-hydramnios).

Material and Methods:

This cross-sectional observational study using non-probability consecutive sampling technique was carried out at the Department of Obstetrics and Gynecology of Zia Uddin University Hospital, Karachi (North Nazimabad campus) for a period of six months from 1st October 2019 till 31st March, 2020. After ethical approval from the Ethical Review Committee of the hospital, pregnant mother in-between 18-35 years of age having a gestational age above 24 months with recorded evidence of oligo-hydramnios (confirmed by an AFI of 5 cm or below) were included in the study. The exclusion criterion comprised of medical conditions related to pregnancy like pregnancy induced hypertension, pre-eclampsia, eclampsia, essential hypertension, renal disease or with diabetes mellitus. In addition, pregnant mothers with evidence of fetal congenital anomaly and pregnant mothers that were lost to follow up were also excluded from the study.

At the first visit, after obtaining of written and informed consent, a detailed history along with general physical examination was carried out. Ultrasonography and routine laboratory tests were also done. The demographics of mothers, their relevant clinical record and findings of physical examination and ultrasound findings were noted. Follow up of pregnant mothers were done at an interval of two weeks for ultrasonography assessment for amount of liquor. Maternal and fetal complications at intrapartum period were recorded.

SPSS version 20 was used for data analysis. The qualitative variables like demographics (booking status, occupation and educational status), mode of delivery, indication for cesarean section, perinatal outcomes, Apgar scores at 1 min and 5 min, need for NICU admission, and complications with decreased AFI were recorded as frequency in percentages. Quantitative data such as age, gestational age were reported as mean and standard deviation. Chi-square test was applied to test for significance between complications with decreased AFI and mode of delivery, keeping p-value of <0.05 as statistically

Table 1: Demographics of pregnant mothers included in the study (n=250)

Variable	Mean±SD n(%)
Age (years)	
<20	25(10.0%)
21 to 25	106(42.40%)
26 to 30	83(33.20%)
>30	36(14.40%)
Gestational Age (weeks)	36.47±2.21
Booking Status	
Booked	199(79.6%)
Un-booked	51(20.4%)
Occupation	
House Wife	232(92.8%)
Working Woman	18(7.2%)
Educational Status of Women	
Secondary	85(34.0%)
Primary	50(20.0%)
Illiterate	35(14.0%)

Table 2: Maternal outcomes with AFI <5 (n=250)

Variable	n	%
Mode of Delivery		
Spontaneous Vaginal Delivery	58	23.2
Forceps Vaginal Delivery	13	5.2
Vacuum Vaginal Delivery	12	4.8
EMLSCS	93	37.2
ELSCS	74	29.6
Indication of C/S		
Previous C/S (1 or 2 C/S)	16	17.2
Non Progressive Labor	19	20.4
Fetal Distress	25	26.8
Breech Presentation	4	4.3
Absent Liquor (AFI=0)	8	8.6
Reverse Diastolic Flow	2	2.2
Failed Induction	2	2.2
Meconium (Grade II to III or IV)	6	6.5
IUGR	4	4.3
Preterm Labour	7	7.5

Table 3: Perinatal outcomes with Apgar score and need for NICU admission among neonates (n=250)

Variable	n	%
Perinatal Outcome		
Meconium aspiration syndrome	10	4.0
Low birth weight (<2.5)	91	36.4
Respiratory distress	2	1.2
Sepsis	10	4.0
Hypoglycemia	7	2.8
Perinatal Mortality	5	2.0
Apgar Score (≤6)		
at 1 min	100	40.0
at 5 min	22	8.8
NICU admission	109	43.6

significant.

Results:

From the total of 250 pregnant mothers included in the study with mean age of 25.94±4.52 years, 25(10%) mothers were below the age of <20 years, 106(42.4%) were between 21 to 25 years of age, 83(33.2%) between 26 to 30 years and 36(14.4%) were above the age of 30 years. Mean gestational age was 36.47±2.21 weeks. 199(79.6%) of cases were booked while 51(20.4%) were un-booked case. 232(92.8%) mothers were housewives while 18(7.2%) were working woman. 35(14%) of mothers were illiterate, 50(20%) had primary education, 85(34%) secondary education while 80(32%) bachelor and above as shown in table-I.

With regards to the mode of delivery, spontaneous vaginal delivery was observed in 58(23.2%) mothers, forceps vaginal delivery in 13(5.2%), vacuum vaginal delivery in 12(4.8%), EMLSCS in 93(37.2%) and ELSCS in 74(29.6%) of mothers. In cesarean section mothers, the indication for cesarean section was previous history of Cesarean Section in 16(17.2%) of patients, non-progression of labor in 19(20.4%), fetal distress in 25(26.8%), absent liquor (AFI=0) in 8(8.6%), breech presentation in 4(4.3%), reverse diastolic flow in 2(2.2%), failed induction in 2(2.2%), meconium (grade II to III or IV) in 6(6.5%), intra-uterine growth restriction in 4(4.3%) and pre-term labor in 7(7.5%) of mothers as shown in table-II.

Regarding perinatal outcome, low birth weight of <2.5 kg was seen in 91(36.4%) of mothers, Meconium Aspiration syndrome (MAS) in 10(4%), sepsis in 10(4%), hypoglycemia in 7(2.8%), perinatal mortality in 5(2%) and respiratory distress in 2(1.2%) of neonates. Apgar score of <6 at 1 min was recorded in 100(40%) neonates while Apgar score at 5 min was observed in 22(8.8%) of neonates. The need for NICU admission was reported in 109(43.6%) of neonates as shown in table-III.

The complications reported in mothers with a decreased AFI in terms of mode of delivery

Table 4: Association between complications with AFI <5 and mode of delivery (n=250)

Variable	Mode of Delivery				p-value	
	Caesarean section		Vaginal			
Complications with decreased AFI	0	69	60.0	46	40.0	0.017*
	1	47	66.0	24	34.0	
	2	44	85.0	8	15.0	
	3	7	58.0	5	42.0	
Total		167	67.0	83	33.0	

were reported as follows. No complications were reported in 69 (60%) of mothers undergoing cesarean section and 46 (40%) mothers undergoing vaginal delivery.¹ complication was seen in 47 (66%) mothers that underwent cesarean section while in 24 (34%) undergoing vaginal delivery.² complications were observed in 44 (85%) of mothers having cesarean section and 8 (15%) having vaginal delivery.³ complications were reported in 7 (58%) of mothers that underwent cesarean section while in 5 (42%) of mothers that had vaginal delivery. A significant difference of 0.017 was observed with regards to the association between complications due to decreased AFI and mode of delivery as shown in table IV.

Discussion:

Estimating volume of amniotic fluid is now regarded as an integral part of antenatal fetal surveillance. Decreased amniotic fluid can cause risk for perinatal mortality and morbidity.¹⁴ In the present study, a decreased AFI of <5 in pregnant mothers was associated with a higher risk of both maternal and fetal complications. Maternal complications included non-progression of labor (20.4%), fetal distress (26.8%), breech presentation (4.3%), failed induction (2.2%), meconium (6.5%), IUGR (4.3%) and pre-term labor (7.5%). Perinatal complications were meconium aspiration syndrome (4%), low birth weight <2.5 kg (36.4%), respiratory distress (1.2%), sepsis (4%), hypoglycemia (2.8%) and perinatal mortality (2%). An Apgar score of < 6 at 1 min was seen in 40% of neonates while at 5 min was reported in 8.8% of neonates. The need for NICU admission was seen in 43.6%. Similarly a significant difference of 0.017 was observed in relation to complications due to decreased

AFI and mode of delivery.

Frequency of maternal complications in our study was 30.8% while for perinatal complications; the reported frequency was 50%. Similar to the findings of our study, another study reported that among mother with an AFI <5, 27.4% of mothers were observed to have maternal complications while 66.3% peri-natal complications were reported.¹⁵ In accordance with our study where the highest maternal and fetal complications due to oligo-hydramnios were fetal distress and low birth weight respectively, another study also reported a high frequency of low birth weight and fetal distress. Mirji S, Satia M et al.¹⁶ also observed over 50% of deliveries been carried out by cesarean section, similarly in our study as well, majority of deliveries were through cesarean section.¹⁶

Chate P, Khatri M et al.,¹⁷ in their research reported fetal distress in 42% of cases as opposed to 27% in our study.¹⁷ In yet another study, the reported frequency of fetal distress due to oligo-hydramnios was 36.1%.¹⁸ The highest frequency was reported in a South Asian study, amounting to 80%.¹⁹ The probable reason behind such high frequency is the fact that the studies were carried out on rural population with minimal understanding of maternal and fetal health and well-being. In one of the studies the observed frequency of cesarean section due to oligo-hydramnios was 64%, similar to our study of 66.8% of deliveries were by cesarean section.²⁰

Some researchers have been of the view that oligohydramnios is not a predictor of adverse maternal or perinatal outcomes (measured by Apgar score) and admissions into NICU. They have regarded that good outcomes are determined by aggressive antepartum and intrapartum managements that the mothers had been provided.²¹ On the other hand other researchers have recommended that AFI is the preferred variables for measuring the outcome of maternal and fetal well-being, however having mild to poor sensitivity towards adverse outcomes of pregnancy.²²

Nonetheless majority of the studies including

ours have concluded that and AFI < 5 cm after 37 gestational weeks is indicator of poor maternal and perinatal outcomes. It is associated with a thick meconium stained liquid, fetal distress, low 1 min and 5 min Apgar score, low birth weight, perinatal mortality and morbidity etc. Determining AFI can aid in other surveillances of fetus. This way can help in identifying infants which are at higher risk for poor perinatal outcome. Determination of AFI must be done as a routine screening test rather than a specialized test.²³

Conclusion:

We conclude that the risk for adverse maternal and fetal outcomes increased when amniotic fluid index decreased to below 5. Significant association was observed in terms of the complications due to AFI <5 and mode of delivery. Fetal distress and low birth weight were the most commonly observed adverse maternal and fetal outcomes reported.

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Role and contribution of authors:

Dr Samina Kemal, collected the data, references and did the initial write up.

Dr Midhat Kemal, collected the data and helped in introducton writing.

Dr Shazia Sultana collected the data, references and review the article and advised useful changes.

Prof. Rubina Hussain, critically review the article and made the final changes

Khasheaa Nadeem, collected the data, references and helped in discussion writing.

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