

Amniotic fluid index measurement – A noninvasive better predictor of foetal outcome

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Abstract

Aim & objectives: To predict the perinatal outcome by measurement of amniotic fluid index (a non invasive method)

Material and methods: This was a prospective study conducted between 2014 January and 2017 January over 200 pregnant women of term singleton pregnancy (between 37 – 42 weeks). Statistical analysis was done using Chi-Square test to determine significance of correlation between AFI and perinatal outcome. P Value < 0.05 was taken as significant. All the recruited pregnant women were divided in to 2 groups: Group 1 – AFI ≤ 5; Group 2 AFI > 5 cm

Result: In this study gestational age less than 38 weeks at delivery was in present in 19 women (55.88%) in group I, where as it was in 57 women (34.34%) in group-II (P-Value = .01) NST was non-reactive in 19 women (55.88%) in group- I and in 16 women (9.63%) in group – II (P-value = .00001). LSCS was done in 47.06% of women in group-I and 28.91% women in

group II (P-value = .038). Birth weight of newborn was <2.5 kg in 19 (55.88%) in group-I, and it was 36 (21.68%) in group-II (P-value = .0004). APGAR score <7 at 1 minute was in 12 (35.29%) in group-I and 18 in (10.84%) group-II (P-value = .002) .

Conclusion: AFI <5 is associated is adverse perinatal outcome like low birth weight and low apgar score at the time of birth.

Keywords: Oligohydramnios, Non stress test, birth weight, Apgar score

Introduction

Amniotic fluid is not only a nourishing media for growing foetus but measurement of amniotic fluid index is closely related with perinatal outcome and mode of delivery. As it is a noninvasive test, so measurement of AFI has become very important part of obstetrical management and decision making. So this study was done to explore extent of correlation between AFI and perinatal outcome.

Importance of amniotic fluid for foetal growth and development is known to people since ancient era. With the emergence of ultrasound technology correlation between amniotic fluid volume and perinatal mortality and morbidity are now well established. Quantification of amniotic fluid volume and its effect on foetal growth and mode of delivery is an important area of study in perinatology as well as in obstetrics. Amniotic fluid index is an important parameter to assess fetal wellbeing. Amniotic fluid not only provide nourishment to growing foetus but also provides cushion effect to the foetus, prevents infection and help in development of musculo skeletal system. Oligohydramnios leads to hypoplasia of lungs and limbs of foetus. Dynamic equilibrium of amniotic fluid is maintained by sum of foetal urine and fluid from lung flowing in to and out of the amniotic sac due to swallowing reflex of fetus and absorption by amniotic membrane¹. Oligohydramnios may be the earliest sonographic indicator of adverse perinatal outcome². Also measurement of amniotic fluid index (AFI) is noninvasive method and low AFI helps in planning delivery, its timing and mode (induction or elective LSCS). Therefore this study was conducted to establish correlation between AFI and perinatal outcome.

Material And Methods

This was a prospective study conducted between 2014 January and 2017 January over 200 pregnant women of term singleton pregnancy (between 37 – 42 weeks). Statistical analysis was done using Chi-Square test to determine significance of correlation between AFI and perinatal outcome. P Value < 0.05 was taken as significant.

Inclusion criteria

1. Term singleton pregnancy (between 37 completed weeks to 42 completed weeks)

2. Cephalic presentation
3. No medical or Obstetrical complications.

They should have USG Doppler report with AFI measurement within one week of delivery.

Exclusion Criteria

- 1- Multiple pregnancy
- 2- Rh incompatibility
- 3- Gestational diabetes
- 4- Anomalous foetus
- 5- Ruptured membrane

All recruited patients were subjected to detailed history, clinical examination and ultrasound. Amniotic fluid index was calculated by four quadrants Phelan's³ technique. Ethical guidelines were followed and informed consent was taken from all the recruited women. Subjects were divided in to 2 groups – Group 1 – AFI \leq 5; Group 2 AFI > 5 cm.

Maternal outcome and foetal outcome were recorded and tabulated. In maternal outcome mode of delivery – vaginal or LSCS were recorded. In vaginal delivery whether it was spontaneous labour or induced labour, was noted. Indications of LSCS were also noted in all cases. To know perinatal outcome multiple parameters were recorded like –

- (i) NST (Non stress test) in all recruited women
- (ii) APGAR score at 1 minute and 5 minute
- (iii) Meconium staining of liquor
- (iv) Birth weight
- (v) NICU admission and duration of stay.

Result

In the current study of 200 pregnant mothers, mean age was 28.8 years in group I and 26.4 years in group II. Table – 1 demonstrates obstetrical demographic characteristics of two populations. In group – I gestational age less than 38 weeks at delivery was in 19 women (55.88%), where as it was in 57 women

(34.34%) in group-II (P-Value = .01). In group- I, 23 (67.65%) women were primipara and in group- II, 99 (59.63%) were primipara (P-Value = 0.38), Induction of labour was done in 25 women (75.53%) in group-I and 85 women (51.21%) in group- II (P-Value = .01). Weight gain <10 kg (table-I) was in 12 women (55.29%) in group-I and 14 women (8.4%) in group-II (p-value = .00002).

NST findings were also significant among two groups (Table- 2) NST was reactive in only 15 women (44.12%) in group- I and non reactive in 19 women (55.88%) in group- I NST was reactive in 150 (90.36%) women and non reactive in 16 women (9.63%) in group – II (P-value = .00001, which is significant). Mode of delivery (table – 3) was LSCS in 16 women in group-I and 48 women in group II (P-value = .038). Indications for LSCS were foetal distress in 11 women in group- I and 16 women in group- II (P-value = .029). Table – 5, demonstrates the perinatal outcome. Birth wt of newborn was <2.5 kg in 19 in (55.88%) group-I, and it was 36 (21.68%) in group-II (P-value = .0004). APGAR score <7 at 1 minute was in 12 (35.29%) in group-I and 18 in (10.84%) group-II (P-value = .002) whereas APGAR score <7 at 5 minute was 2 in (5.88%) group-I and 6 in (3.6%) group-II (P-value = .53)

Table 1: Obstetric Characteristics of Study Population

	AFI < 5 (n=34)	AFI > 5 (n=166)	P-Value
Mean age (in years)	28.8	26.4	-
Nullparity	23 (67.65%)	99 (59.63%)	0.38
Gestational AFI < 38 weeks @ Delivery	19 (55.88%)	57 (34.34%)	.01
Weight gain	12 (35.29%)	14 (8.4%)	.00002

< 10 kg			
Induction of labour	25 (75.55%)	85 (51.02%)	0.01

Table 2: NST Characteristics of two Populations

	AFI < 5 (n=34)	AFI > 5 (n=166)	P- Value
NST – R	15 (44.12%)	150 (90.36%)	.00001
NST – NR	19 (55.88%)	16 (9.63%)	
Total	34	166	

Table 3: Mode of delivery of two Populations

	AFI < 5	AFI > 5	P- Value
LSCS	16 (47.06%)	48 (28.91%)	.038
ND	18 (52.94%)	118 (71.08%)	
Total	34	166	

Table 4: LSCS rate in two Populations due to foetal distress

	AFI < 5	AFI > 5	P- Value
CS for Fetal Distress	11 (68.75%)	18 (37.5%)	.029
CS for other causes	5 (31.25%)	30 (62.5%)	
Total	16	48	

Table 5: Perinatal Outcome based on AFI among two Populations

	AFI < 5	AFI > 5	P- Value
Weight < 2.5 kg	19 (55.88%)	36 (21.68%)	.00004
APGAR @ 1 min < 7	12 (35.29%)	18 (10.84%)	.002
APGAR @ 5 min < 7	2 (5.88%)	6 (3.6%)	.53

Discussion

Amniotic fluid is very essential media for growth of foetus. This is the reason that number of studies had already been done and many are in progress studying correlation between amniotic fluid volume and perinatal outcome. So, in the modern perinatal medicine amniotic fluid volume is one of the main cornerstone of study and research⁴. Kofinas, chauhan, Senderson, Hendrix and Megnan⁵⁻⁶ studied the correlation between amniotic fluid index and prenatal outcome in the antepartum and intrapartum periods. They conducted meta-analysis over 10,551 patients and concluded that AFI<5 cm. is associated with increased risk of non reassuring foetal heart sound and cesarean delivery as well as low apgar score at 5 minutes. These conclusions are consistent with the result of our present study.

Objective of this study was to study the risk of cesarean delivery for foetal distress and 5 minutes apgar score < 7 with its correlation with Antepartum AFI > 5cm. or < 5 cm. Inclusion criteria of studies were similar to our inclusion criteria of AFI > 5 cm or < 5 cm. In our study, in women with AFI < 5 cm, high incidence of non reactive NST was recorded. Non reactive NST was 55.88% in gr-I and 9.63% in group II (p value=.00001; which is significant). Non reactive NST with AFI < 5cm was 69.23%, 41.55% and 40% in the study by Chandra et al, Sriya et al and Kumar et al respectively⁷⁻⁹. These all studies demonstrated high incidence of non reactive NST when AFI value was < 5 cm.

Another study was conducted by Boron C and Morgon¹⁰ about impact of amniotic fluid volume on perinatal outcome. They observed seven fold increased cesarean delivery rate and reported increased rate of variable deceleration (50% increased rate) during

labour. In our study in group-1, rate of LSCS was 47.06% and in group-II LSCS rate was 28.91% (p value is .038; which is significant). Indication of LSCS in group I was 68.75% and in Group II fetal distress was indication in 37.5% of cases (p value .029)

Association between SGA newborn and AFI <5 cm. in uncomplicated term pregnancy was studied by Morris et al¹¹. They reported that 60% of babies were of low birth weight when AFI was < 5 cm. They concluded that there is strong correlation between growth retarded baby and oligohydramnios.

In our study birth weight < 2.5 kg. was found in 55.88% in group I and 21.68% in group II. P value was .00004 which is statistically significant.

One of the important parameter to compare perinatal outcome is assessment of APGAR score at 1 minute and 5 minute. In a meta-analysis by chauhan et al⁶, reported that antepartum AFFI \leq 5 cm. was associated with a 5 minute APGAR score < 7 (pooled RR – 1.8, 95% CI 1.01 – 2.06). In current study APGAR score < 7 at 1 minute was associated in 35.29% of cases in group – I, where as in group – II, APGAR score was < 7 in 10.84% of babies (p value=.002). There was no significant difference in APGAR score among two groups at 5 minutes. It was 5.88% in group – I and 3.61% in group – II. Similar study was conducted by Grrubb at el¹². They reported that 1 minute apgar score was < 7 in 84% of new born babies when antepartum AFI < 5 cm, whereas it was only 14% when AFI was > 5 cm. At the same time they reported Apgar score < 7 in 13% of new born babies at 5 minutes when AFI < 5 cm in comparison to APGAR score < 7 in only 5 % of babies of normal AFI mother.

So the result of our study concluded that AFI < 5 cm should never be overlooked. As it is associated with a no. of adverse perinatal outcome like low birth weight

infants, high incidence of non assuring NST with variable deceleration, high incidence of LSCS, low APGAR score at 1 minute and high incidence of NICU admission.

Conclusion

One of the aims of modern obstetrics is to decrease the incidence of perinatal morbidity and mortality. This is the reason why many research studies are on the way studies are on the way studying “Correlation between adverse perinatal outcomes, increased LSCS rate with Oligohydramnios” despite so many studies and meta-analysis had already been done. All studies concluded that low AFI <5 cm. was associated with high rate of LSCS and adverse perinatal outcome. So whenever AFI <5 cm is there in USG report, in term pregnancy or near term pregnancy, a delivery plan should be made keeping in mind all obstetrical and systemic factor and remembering adverse perinatal outcome. Also individualization of case should be done and decision should be made either for induction of labour or LSCS. During induction of labour, continuous foetal monitoring should be done and there must be facility for emergency LSCS.

References

1. Ross MG, Brace RA. National Institute of Child Wealth and Development Conference Summary; amniotic fluid biologic- basic and Clinical aspects. J Maternal Foetal Med. 2001;10(1):2-19
2. Hashimoto BE, Kramer Dj, Brennan L. Amniotic fluid Volume: fluid dynamics and measurement technique. Semin Ultrasound CT MR, 1993; 14(1):40-55
3. Phelan JP, Ahn MO, Smith CV et al. Amniotic fluid index measurements during pregnancy. J Reprod Med. 1987; 32:601-04
4. Manning FA; Antepartum fetal testing: A Critical appraisal, Curr Opin Obst Gynecol.2009;21(4):348-52
5. Kofinas A, Kofinas G. Differences in amniotic fluid pattern and fetal biometric parameters in third trimester pregnancies J Maternal Fetal Neonatal Med 2006;19(10):633-38
6. Chauhan SP, Sanderson M, Hendrix NW et al. Perinatal outcome and Amniotic fluid index in the antepartum and intrapartum periods : a metaanalysis. Am J Obstet Gynecol. 1999;181(6):1473-78
7. Chandra P, Kaur SP, Hans DK, Kapika AK. The impact of amniotic fluid Volume assessed intrapartum on perinatal outcome. Obstet Gynecol Today. 2000; 5:478-81
8. Sriya R, Singhai S. Perinatal outcome in patients with amniotic fluid index ≤ 5 cm. J Obstet Gynecol India. 2001; 51:98-10
9. Kumar P, Iyer S, Ram Kumar V. Amniotic fluid index : a new ultrasound assessment of amniotic fluid. J Obstet Gynecol India. 1991; 41: 10-2
10. Boron C, Morgan MA, Garite TJ. The impact of amniotic fluid Volum assessed intrapartum on perinatal outcome. Am J Obstet Gynecol. 1995; 173(1): 167-74.
11. Morris JM, Thompson K, Smithey J, Gaffney G, Cooke I Chamberlain P et al. The usefulness of ultrasound assessment of amniotic fluid in predicting adverse outcome in prolonged pregnancy: a prospective blinded observational study. Br J Obstet Gynecol. 2003; 110(11): 989-94

12. Grubb DK, Paul RH. Amniotic fluid index and prolonged antepartum fetal heart rate deacceleration. *Obstet Gynecol.* 1992; 79(4): 558-60.