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Dr. Meda Sushma
Assistant Professor, Department of Obstetrics & Gynaecology, Kamineni Institute of Medical Sciences, Narkatpally, Nalgonda district, Telangana, India

Dr. Soujanya Sukhavasi
Assistant Professor, Department of Obstetrics & Gynaecology, Kamineni Institute of Medical Sciences, Narkatpally, Nalgonda district, Telangana, India

Corresponding Author:
Dr. Soujanya Sukhavasi
Assistant Professor, Department of Obstetrics & Gynaecology, Kamineni Institute of Medical Sciences, Narkatpally, Nalgonda district, Telangana, India

Study of low amniotic fluid index as a predictor of adverse perinatal outcome

Dr. Meda Sushma and Dr. Soujanya Sukhavasi

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Abstract
This study was conducted in the Kamineni Institute of Medical Sciences, Narkatpally for over a period of one yeari.e, from APRIL 2017 to OCTOBER 2018, among 60 pregnant women at term (37-42 weeks), after exclusion of surgeries and multiple pregnancies, prelabour rupture of membranes. All the women in the study population underwent routine investigations. An ultrasound was done and AFI was calculated by four quadrant technique described by Phelan *et al*. Cases were categorized into different groups depending on the value AFI ≤5 cms - oligohydramnios The incidence of thick meconium stained amniotic fluid was high among oligohydramnios, as cord compression was more common among them. Hence, the cesarean section rates are more for fetal distress. Other indications for emergency delivery: CPD in labour, failure to progress and prolonged second stage were common in patients of oligohydramnios. The present study was done to evaluate fetal outcome in relation to AFI. It was found that determination of AFI can be used as a screening test to predict cases of fetal distress during intrapartum period requiring LSCS. The difference in the value of APGAR scores at 1 min and 5 mins was statistically significant in oligohydramnios. Birth weights < 2500 gms was seen more in oligohydramnios group (25%). Low birth weight is a feature of oligohydramnios.

Keywords: Oligohydramnios, Meconium, NICU, APGAR Score, Low birth weight

Introduction
The precise origin of the liquor amnii is still not well understood. It is probably of both maternal and foetal origin. Liquor amnii provides fluid medium for the early development of the embryo protecting it from concussion, pressure, desiccation, reminiscent of the aquatic origin of life.
In normal pregnancies, the volume of amniotic fluid increases to about one litre at 36 weeks which is the maximum level. Amniotic fluid volume rises progressively during gestation until 36 weeks, the mean amniotic fluid volume is relatively consistent in the level of 700 – 800 ml. After 40 weeks there is a prospective decline of amniotic fluid volume at a rate of 8 % per week, with amniotic fluid volume averaging about 400 ml at 42 weeks. The clinical picture of reduced amniotic volume is termed as Oligohydramnios.
Oligohydramnios is associated with increased risk of adverse perinatal outcome. The umblical cord compression during labour is common with oligohydramnios which increases the risk for caesarean delivery, because of foetal distress and5 minute apgar score less than 7. The decrease of amniotic fluid volume is associated with the increased labour induction, still birth, non reassuring foetal heart pattern, meconium aspiration syndrome and neonatal death.
Fetal distress in labor is a common occurrence and is of great concern for both patient and the physician. An evaluation to predict early in the course of labor, which fetus is at risk of developing distress could aid in the management of labor. The concept of "admission test" was introduced to identify the patients whose antepartum risk factors have been missed, and to triage the patients in early labor into high risk and low risk groups. Cardiotocography for 20 minutes (NST) and response to vibroacoustic stimulation have been used as admission tests [1]. Another variable that has got great impact on the fetal condition in the intrapartum period is amniotic fluid volume. Previously the amount of amniotic fluid was relegated to an "after thought" during amniorrhexis. Now evaluation of amniotic fluid has become an integral part of sonographic evaluation of the gravid patient [2].
Although clinicians were readily able to recognize the development of acute increase of amniotic fluid in their patients, it was difficult to recognize too little amniotic fluid (oligohydramnios) [2]. Oligohydramnios in the antepartum period has been associated with

intrauterine growth restriction, post dated pregnancy, congenital anomalies, increased fetal morbidity and abnormal antepartum fetal heart rate patterns.
The present study is undertaken to assess the perinatal outcome in amniotic fluid index of 5 cms or less in term pregnancies.

Materials and Methods

A prospective study on the perinatal outcome in term pregnancies with amniotic fluid index less than 5 cmswascarried out in period of April 2017 to October 2018 in Kaminenei Institute of Medical Sciences.
History regarding age, parity, duration of gestation, menstrual history, obstetric history and history of any complications in present pregnancy was noted.
General clinical examination was done. Pulse rate, blood pressure & temperature was noted. Symphysiofundal height was measured. Uterine size, presentation & adequacy of amniotic fluid clinically, was noted. Foetal heart rate was counted. Per-speculum & per -vaginum examination was done to see any rupture of the membranes. Necessary investigations were done. Non stress test was done. An ultrasound examination was done for foetalwell being and amniotic fluid index was measured by the technique described by Phelan *et al*. [3]
A curvilinear transducer was used. By marking, the uterus was divided into four quadrants using the maternal sagittal midline vertically and an arbitary transverse line approximately half way between the symphysis pubis and upper edge of uterine fundus. The transducer will be kept parallel to the maternal sagittal plane and perpendicular to the maternal coronal plane throughout.
The deepest, unobstructed and clear pocket of amniotic fluid is visualized and the image was frozen. The ultrasound calipers was manipulated in such a way to measure the pocket in a strictly vertical direction. The process was repeated in each of the four quadrants and pocket. measurement will be summed to give the AFI. Patients was grouped according to their AFI, as AFI 5 cm or less. The patients was followed up by observing the mode of delivery, if delivery is made by caesarean section, the indication was recorded. The condition of babies was assessed by birth weight, apgar score, color of liquor and the need for neonatal admission. These babies were followed till one week after birth.

Inclusion Criteria

Pregnant women with gestational age at or more than 37 weeks
AMNIOTIC FLUID INDEX 5 cms or LESS.

Exclusion Criteria

Patient with rupture of amniotic membranes
Patient with foetus having congenital anomalies like renal agenesis, polycystic kidneys.
Patient with multiple gestation.
Patient less than 37 weeks gestation.
Patient with previous LSCS, MYOMECTOMY.

Data Analysis

Statiscial analysis of the data was performed by using Microsoft excel 2007. Data was represented in the form of frequencies and percentages with the help of tables, bar diagrams and pie diagrams.

Results

This study was conducted in 60 term pregnant women who were admitted in Department of Obstetrics and Gynaecology, Kaminenei Institute of Medical Sciences for a period of one year. (APRIL 2017 – OCTOBER 2018)
Routine investigations were done for all women. USG was done to assess the fetus and amniotic fluid volume. Amniotic fluid index was calculated by four quadrant technique. AFI 5 or less than 5 cms is considered as oligohydramnios.
The parameters analysed include nature of amniotic fluid, mode of delivery, method of induction, incidence of LSCS, instrumental delivery and normal delivery. APGAR score at 1 and 5 min, birth weight, admission to neonatal ward and follow up to one week.

Table 1: Age Distribution (n = 60)

Age (years)	Number of patients	%
16-20	8	13.3
21-25	40	66.6
26-30	20	33.3
31-35	2	3.33
Total	60	100

From the above table, it was observed that 66.6 % of women in study population are 21 – 25 years of age.

Table 2: Gestational Age Distribution

Gestational Age in weeks	NO. of patients	%
37-40	40	66.6
40-42	20	33.3
Total	60	100

From the above table, it was observed that 66.6% of women in the study population are 37-40 weeks of gestation and 33.3% of women are between 40-42 weeks of gestation age.

Table 3: Gravida Distribution (n = 60)

Gravida	Number	%
Primi	27	45
2nd gravida	20	33.3
3rd gravida	10	16.66
Multi gravida	3	5
Total	60	100

Majority of women in the studyare primigravida 45%, followed by 2nd gravida of 33.3%. 3rd gravida are of 16.6%, multigravidae are of 5%.

Table 4: Distribution of Booked/Unbooked Cases (n=60)

Cases	Number	%
Booked	20	33.3
Unbooked	40	66.6
Total	60	100

From the above table, most of the study population belongs to unbooked cases (66.6%).

Table 5: Table Showing Nature of Amniotic Fluid (n = 60)

Nature of amniotic fluid	Number of patients	%
Thin meconium	07	11.6
Thick meconium	33	55
Clear	20	33.3
Total	60	100

From the above table it was observed that thick meconium stained liquor was seen in 55% of women among study population, 11.6 %of women have thin meconium stained liquor

and 33.3% of women have clear liquor.

Table 6: Showing the mode of delivery (n= 60)

Mode of delivery	Number of cases	Percentage
Normal	20	33.3%
Instrumental	10	16.6%
Caesarean	30	50%
Total	60	100%

From the above table, among the 60 women of study population, 33.3% had normal vaginal delivery, 16.6% instrumental and 50% caesarean delivery.

Table 7: APGAR SCORE>7 and <7.

N(60)	APGAR >7	APGAR<7
Number of babies	35	25
percentage	58.3%	41.6%

From the above table, it is observed that 58.3 % babies had APGAR >7.

Table 8: APGAR SCORE>7 and <7 AT 1 AND 5 Mins.

APGAR score	No. of cases	
	APGAR >7	APGAR<7
At 1 min.	47	25
At 5 min.	50	18

From the above table, it is observed that APGAR score <7 at 1 min were seen in 25% of women and APGAR score <7 at 5 min were seen in 18% of cases among study population. The occurance of low APGAR (<7) at 1 min is high among study population

Table 9: The Birth Weight (in gms) (n=60)

Birth wt (in gms)	Number of babies	%
<2500	25	41.6
2501-3000	18	30
3001-3500	12	20
3501-4000	5	8.3
Total	60	100

From the table 6, it is observed that women in the study population is associated with increased incidence of low birth weight (<2500 gms) which signifies the relationship between amniotic fluid volume and birth weight.

Table 10: The Incidence of Nicu Admissions (n = 60)

Number of babies	Number of patients	Percentage
60	15	25

From the above table, it is observed that 25% of neonates had NICU admissions among study population for various indications, the most common being birth asphyxia and meconium aspiration.

Table 11: Incidence of Perinatal Death (n=60)

Number of babies	perinatal deaths	%
60	4	6.6

Discussion

Oligohydramnios in the antepartum period has been associated with intrauterine growth restriction, post dated pregnancy and abnormal antepartum fetal heart rate patterns.

Thus it seems logical to evaluate amniotic fluid volume in the early intrapartum period as a predictor of fetal morbidity. Thus amniotic fluid index, a semiquantitative method of amniotic fluid estimation, has become an integral part of modified biophysical profile. Amniotic fluid volume is known to reduce with advancing gestational age. In the present study, 33.3% of women among oligohydramnios group are more than 40 weeks gestation age.

Table 12: Comparision of Thick Meconium with Other Studies.

Studies	Occurrence of thick meconium stained liquor
Rutherford *et al*., [4]	54
Sarno *et al*., [1]	41.9
Raj Sriya *et al*., [6]	38.88
Present study	55

In the present study the incidence of thick meconium stained liquor was high among study population accounting for 55% of women and is comparable with the study conducted by Rutherford *et al*., (54%). The studies by Sarno *et al*., [1] showed 41.9% incidence, and Raj Sriya *et al*., [6] 38.88% incidence of thick meconium stained amniotic fluid in the oligohydramnios.

Table 13: Comparision of Incidence of LSCS for Fetal Distress with Other Studies

Studies	Number of patients (%)
Rutherford *et al*., [4]	11
Sarno *et al*., [1]	11.9
Raj Sriya *et al*., [6]	43.05
Present study	35

In the present study, incidence of cesarean delivery for fetal distress was 35 % among study population. This is comparable with the study conducted by Raj Sriya *et al*., [6] (43.05%).
The incidence in the studies conducted by Rutherford *et al*., [4] was (11%) and Sarno *et al*., [1] was (11.9%).

Table 14: Comparision of Apgar Score <7 At 1 Min and 5 Min With Other Studies (%)

Studies		percentage
Rutherford *et al*., [4]	1 min	30
	5 min	11
Sarno *et al*., [1]	1 min	26.2
	5 min	0
Raj Sriya *et al*., [6]	1 min	38.88
	5 min	9.72
Present study	1 min	25
	5 min	18

APGAR score < 7 at 1 min was seen in 25 % of cases among study population in the present study, 30% in the study conducted by Rutherford *et al*., and 38.88% in the study conducted by Raj Sriya *et al*., [6] and 26.2% by Sarno *et al*. [1]

Table 15: Comparision of Occurrence of Birth Weight <2500 gms with Other Studies

Studies	Occurrence of birth weight <2500 gms in %
Raj Sriya *et al*. [6]	58.38
Present study	41.6

In the present study incidence of low birth weight was 41.6% in the study population and 58.3% respectively in the study conducted by Raj Sriya *et al*., [6]
But the high occurance of low birth weights in oligohydramnios

suggests the association between them.

Table 16: Comparision of Neonatal Intensive Care Unit in Different Studies (%)

Studies	Percentage
Baron C *et al*., [5]	8.2
Raj Sriya *et al*., [6]	88.88
Present study	25

In the present study, the incidence of NICU admissions among study population was 25%. But, in the studies conducted by Raj Sriya *et al*. [6], it was even more higher, 88.88% and 8.2% in the study by Baron C *et al*. [5]

Table 17: Comparision of Neonatal Deaths in Different Studies

Studies	percentage
Sarno *et al*. [1]	10%
Raj sriya *et al*. [6]	7.5%
Present study	6.6%

In the present study, the incidence of neonatal deaths among study population was 6.6%. But, in the studies conducted by Sarno *et al*., [1] it was 10%. And in the study by Raj Sriya *et al*., [6] it was 7.5%.

Conclusion

1) Amniotic fluid index measurement can be used as an useful adjunct to other fetal surveillance methods, to identify those infants at risk of poor perinatal outcome.
2) An amniotic fluid index of ≤5 cm detected after 37 completed weeks of gestation is an indicator of poor perinatal outcome. In presence of oligohydramnios, the occurrence of non reactive NST, thick meconium stained liquor, development of fetal distress, the rate of LSCS, low 5 minute Apgar score, low birth weight, perinatal morbidity and mortality are more**.**
3) Intrapartum assessment of amniotic fluid index is better than antepartum fetal assessment, as an immediate evaluation of current fetal condition can be done. AFI when used as an "admission test" in intrapartum period can categorise the fetuses into "high risk" and "low risk" depending on their susceptability to fetal distress.

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Conflict of Interest

The authors declare that they have no conflict of interest

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