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A Study of Amniotic Fluid Index in Term Pregnancy

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KEYWORDS

Amniotic fluid index, Oligohydroamnios, gestational age, intapartum surveillance

A B S T R A C T

Amniotic fluid volume is a variable that has got great impact on the fetal condition in the intrapartum period. Oligohydramnios (5th percentile) is present when amniotic fluid volume is approx 300 ml. The amniotic fluid index (AFI), a semiquantitative technique for assessing amniotic fluid volume, has been shown to be a useful adjunct in antepartum surveillance. We evaluated the usefulness of AFI in early intrapartum period. The present study was conducted on 200 pregnant women with gestational age more than 37 and less than 42 wks, with singleton pregnancy. All patients underwent ultrasound examination and AFI was determined by four quadrant techniques. Depending on AFI, women were divided into 3 different groups. 20% of women were in oligohydramnios group, 21% in borderline group and 59% in normal group. Among oligohydramnios group 45% of women were between 37-40 wks, 55% between 40-42 wks of gestation. In borderline group 57% were between 37-40 wks and 42.8% between 40-42 weeks. In normal group 83.1% were between 37-40 wks and 16.9% between 40-42 weeks. Thick meconium stained liquor was seen in 45% of oligohydramnios group, 14.2% in borderline group and 10.16% in normal group. The incidence of thick meconium stained liquor was 14.2% and 10.16% in group II group III respectively. AFI measurement can be used as an useful adjunct to other fetal surveillance methods, to identify those infants at risk of poor perinatal outcome. Intrapartum assessment of AFI, supplements antepartum fetal assessment as immediate evaluation of current fetal condition can be done. AFI can be used as an "admission test" in intrapartum period in women presenting at labor ward. AFI had a sensitivity of 64% and specificity of 89%.

Introduction

Amniotic fluid volume is a variable that has got great impact on the fetal condition in the intrapartum period.

Oligohydramnios (the 5th percentile) is present when the amniotic fluid volume is approximately 300 ml. 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.¹The amniotic fluid index (AFI), a semiquantitative technique for assessing amniotic fluid volume, has been shown to be a useful adjunct in antepartum surveillance. We evaluated the usefulness of the AFI in the early intrapartum period.

Materials and Methods

The present study was conducted in Department of Obstetrics and Gynecology, at Shadan Institute of Medical Sciences, Hyderabad from January 2011 to May 2012. 200 cases admitted for labor and delivery were selected on the basis of simple random sampling technique.

Thorough history was taken from all cases and complete examination was done. All patients underwent ultrasound examination and amniotic fluid index was determined by four quadrant techniques. Depending on the value of AFI, women were divided into 3 different groups which are as shown in the Table No 1.

Inclusion Criteria

Pregnant Women with gestational age more than 37 weeks and less than 42 weeks, Singleton pregnancy, Patients with true labor pains, AFI assessed by Ultrasound, They should have delivered during the same hospitalization when AFI was determined, Cephalic presentation. The parameters that were recorded were gestational age at delivery, parity and nature of amniotic fluid.

Diagnostic criteria for AFI

Oligohydramnios - AFI \leq 5cm
Low normal – AFI 5.1 – 8cm

Normal – AFI 8.1 – 24cm
Polyhydramnios – AFI >24 cm

Statistical Analysis: Descriptive data are presented as number and percentages. Chi-square test was used for analyzing categorical data. A p-value of 0.05 or less was considered statistically significant.

The present study was conducted on 200 term pregnant women with gestational age more than 37 weeks and less than 42 weeks.

Table no.1 shows distribution of the number of cases in each group. 20% of women were in oligohydramnios group, 21% in borderline group and 59% in normal group. The oligohydramnios and borderline groups were individually compared with normal group with regard to maternal age, gravidity, parity and gestational age and matched. Fig.1 shows the same in graphical form.

Table No. 2 shows that among oligohydramnios group 45% of women were between 37-40 weeks of gestation and 55% were between 40-42 weeks of gestation which is a normal finding as amniotic fluid volume decreases with increasing gestational age. Among borderline group 57% were found between 37-40 weeks and 42.8% between 40-42 weeks. Among normal group 83.1% of women were found between 37-40 weeks and 16.9% between 40-42 weeks. Fig.2 depicts the same in graphical form

Gestational age distribution in 3 groups had a chi-square value of 24.8 with a p-value of < 0.05, which is statistically significant.

Table No.3 shows that thick meconium stained liquor was seen in 45% of women among oligohydramnios group, 14.2% of women among borderline group and 10.16%

of women among normal group. The incidence of thick meconium stained liquor was high in the oligohydramnios group I. The nature of amniotic fluid in different groups had a chi-square value of 53.74 and a p-value of < 0.05 which was statistically significant.

Discussion

The mechanism of amniotic fluid production, consumption, composition and volume depends on the gestational age.³ Amniotic fluid volume at any time is a balance between production and consumption. During the first trimester the major source of amniotic fluid is from the maternal blood within the uterine wall and secretion from amnion. There is active transport of electrolytes and other solutes through the amnion and passive diffusion of water following osmotic pressure changes. There is a large variation of the amniotic fluid within the same subject as it is a dynamic reservoir. It increases rapidly in the first half of pregnancy with close correlation with fetal weight reaching a mean of 60 ml at the end of first trimester, 100-150 ml by 16 weeks, 700 ml by 32 weeks. Then it increases slowly to maximum volume of 800-1000 ml at 37 weeks, thereafter declines gradually to 700-800 ml at 40 weeks. After 40 weeks amniotic fluid decreases at a rate of 8% per week and averages only 400-450 ml at the end of the 42 weeks. It reduces further to a mean of 250 ml and 160 ml at 43 and 44 weeks respectively.⁴ Thus Study of amniotic fluid provides useful information about the well being and also maturity of the fetus.⁵

In 1987 Phelan et al, developed a semiquantitative sonographic assessment of Amniotic fluid volume, known as Amniotic fluid Index. This involves the summing of maximum vertical pockets in each of the four quadrants of the uterus.⁶

The likelihood of low AFI (≤ 5 cms) between 36-40 weeks of gestation was 2.4%.¹ Oligohydramnios in the antepartum period has been associated with intrauterine growth restriction, postdated pregnancy and abnormal antepartum fetal heart rate patterns.¹ Thus it seems logical to evaluate amniotic fluid volume in the early intrapartum period as a predictor of fetal morbidity. Hence amniotic fluid index has become an integral part of modified biophysical profile.⁷

The frequency at which AFI evaluations should be repeated during antepartum testing was evaluated in one study and it was concluded that for women < 41 weeks of gestation, weekly AFI is adequate if the initial measurement is ≥ 8 cm, because the risk of having oligohydramnios within 4 days is only 1.7% and within 7 days is only 2.2%.⁸ (Wing DA et.al,1996). For all patients ≥ 41 weeks of gestation, twice weekly amniotic fluid index assessment is necessary regardless of the initial measurement as, Amniotic fluid volume is known to reduce with advancing gestational age.⁹

The effect of maternal oral hydration with hypotonic solution (water) on amniotic fluid volume was analyzed. Fifty women were made to drink 2 ltr of water in 1 hr. The mean AFI in the hydration group increased significantly by 2.01 ± 2.73 cm. It was concluded that maternal hydration status has a role in regulation of amniotic fluid volume.¹⁰ Increasing AFI correlates linearly with increasing birth weight and macrosomia is associated with an increased incidence of cesarean delivery. AFI > 15 carries over double risk of birth of a macrosomic infant, while AFI > 18 has a risk of over six times.¹¹

Table No.1 Shows distribution of cases among different groups

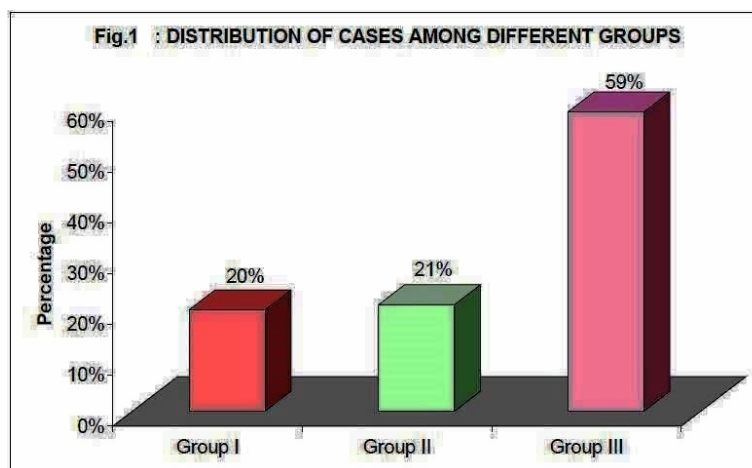
Groups	AFI	No. of Patients	Percentage (%)
I	< 5 Oligohydramnios	40	20
II	5.1-8 Borderline	42	21
III	8.1-24 Normal	118	59

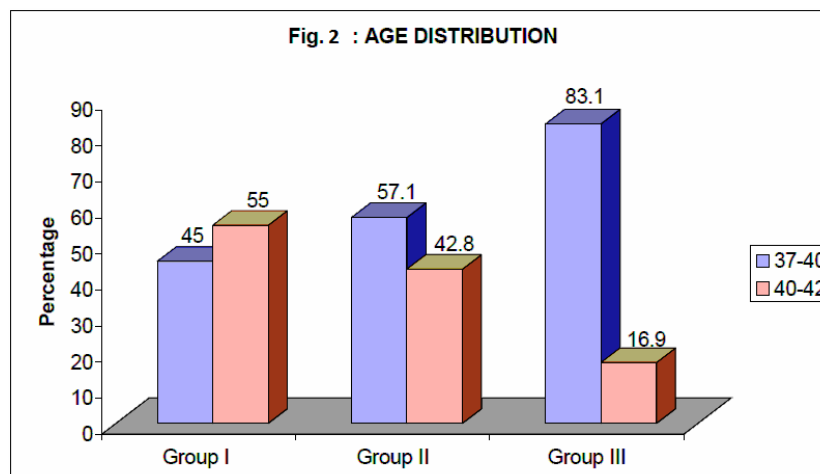
Table No.2 Shows Gestational Age relationship to amniotic fluid Index

Age in Weeks	Group I	%	Group II	%	Group III	%	χ^2	P Value
37-40	18	45	24	57.1	98	83.1	24.8	<0.05 ***
40-42	22	55	18	42.8	20	16.9		
Total	40	100	42	100	118	100		

Table No.3 Table showing nature of Amniotic Fluid among three different groups

Nature of Amniotic fluid	Group I	%	Group II	%	Group III	%	χ^2	P value
Thin	6	15	10	23.8	2	1.69	53.74	<0.05 ***
Thick	18	45	6	14.2	12	10.16		
Clear	14	35	26	61.9	104	88.13		
Total	40	100	42	100	118	100		





In the present study, 55% of women among oligohydramnios group, 42.8% among borderline group and 16.9% among normal group were seen with gestational age in between 40-42 weeks. The incidence of thick meconium stained liquor in our study was high among oligohydramnios group accounting for 45% of women and is comparable with the study conducted by Preshit Chate et. Al, (2013)(46%),¹² and Sarno et al., (1990) (41.9%).¹³ The studies by Raj Sriya et al., (2001) showed 38.88%,¹⁴ Kaushik et.al (2006) & Charu Jandial et.al (2007) 48%,¹⁵ and Rutherford et al. (1987) 54%¹⁶ incidence of thick meconium stained amniotic fluid in the oligohydramnios group.

In the present study the incidence of thick meconium stained liquor was 14.2% and 10.16% in group II group III respectively.

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. AFI \leq 5cm is associated with high incidence of thick meconium stained liquor, fetal distress, operative delivery

and cesarean section for fetal distress and perinatal mortality and morbidity.

3. Intrapartum assessment of amniotic fluid index supplements antepartum fetal assessment, as immediate evaluation of current fetal condition can be done. AFI when used as an “admission test” in intrapartum period in women presenting at labor ward with ruptured membranes after an uneventful pregnancy, could help identify those cases needing special surveillance and categorize the fetuses into “high risk” and “low risk” depending on their susceptibility to fetal distress.
4. In the present study AFI had a sensitivity of 64% and specificity of 89%.

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