

Amniotic Fluid and its Co-Relation with Pregnancy Outcome in High Risk Pregnancies

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Abstract

Aim: The aim of the study is to study AFI <5 cm is an appropriate threshold for pregnancy intervention to prevent adverse outcome of pregnancy, and it is a determining factor in perinatal outcome in high risk pregnancies. To compare caesarean rates between patients with AFI <5 cm and AFI >5 cm in high risk pregnancies. *Methodology:* This study was a prospective, comparative study conducted over a period of two years total of 100 patients were selected in study group 50 high risk patients of >35 weeks pregnancy with an AFI <5cm. In the control group, 50 high risk patients of >35 weeks pregnancy with an AFI >5cm with the same complications of pregnancy. *Results:* The patients showed the mean age of this study population was 28.69±3.51 years and mean marriage duration was 2.89±3.12 years. In study group the highest was in IUGR (asymmetrical) and in which frequency was 18 (36%), and the highest in control group was PD in which frequency was 17 (34%). In group with AFI <5, there was high rate of non-reactive NST compared to group with AFI >5 (p<0.001). The most common indication of LSCS was acute foetal distress followed by oligohydramnios and IUGR. the characteristics of AFI<5 cm was highest for normal Apgar score at 5 mins >6 which was 22 (44%), AFI >5cm was highest for normal Apgar

score at 5 mins >6 which was 46 (92%). *Conclusion:* From the present study, it was concluded that predictor of adverse outcome for high risk antepartum or intrapartum ladies is AFI, timely intervention is done along with antepartum and intrapartum fetal monitoring if early recognition alerts an obstetrician to prevent perinatal catastrophe and in neonatal care, there is need for improvement.

Keywords: Amniotic Fluid; Antepartum.

Introduction

The amniotic fluid is the protective liquid contained by the amniotic sac of a gravid Amniote. This fluid serves as a cushion for the growing fetus, but also serves to facilitate the exchange of nutrients, water, and biochemical products between mother and fetus. For humans, the amniotic fluid is commonly called water or waters (Latin liquor amnii). Amniotic fluid, also known as Camerons fluid is present from the formation of the gestational sac. Amniotic fluid is in the amniotic sac. It is generated from maternal plasma, and passes through the fetal membranes by osmotic and hydrostatic forces. When fetal kidneys begin to function in about week 16, fetal urine also contributes to the fluid.¹ In earlier times, it was believed that the amniotic fluid was composed entirely of fetal urine. The fluid is absorbed through the fetal tissue and skin. After the 15th-25th week of pregnancy when the keratinization of an embryo's skin occurs, the fluid is primarily absorbed by the fetal gut. At first, amniotic fluid is mainly water with electrolytes, but by about the 12-14th week the liquid also contains proteins, carbohydrates, lipids and phospholipids,

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and urea, all of which aid in the growth of the fetus [2]. The volume of amniotic fluid increases with the growth of fetus. From the 10th to the 20th week it increases from 25ml to 400ml approximately. Approximately in the 10th-11th week the breathing and swallowing of the fetus slightly decrease the amount of fluid, but neither urination nor swallowing contributes significantly to fluid quantity changes, until the 25th week, when keratinization of skin is complete. Then the relationship between fluid and fetal growth stops. It reaches a plateau of 800ml by the 28-week gestational age. The amount of fluid declines to roughly 400 ml at 42 weeks [3]. There is about 1L of amniotic fluid at birth. The forewaters are released when the amnion ruptures. This is commonly known as the time when a woman's "water breaks". When this occurs during labour at term, it is known as "spontaneous rupture of membranes". If the rupture precedes labour at term, however, it is referred to as "premature rupture of membranes". The majority of the hindwaters remain inside the womb until the baby is born. Artificial rupture of membrane (ARM), a manual rupture of the amniotic sac, can also be performed to release the fluid if the amnion has not spontaneously ruptured. Swallowed amniotic fluid creates urine and contributes to the formation of meconium.

Amniotic fluid protects the developing baby by cushioning against blows to the mother's abdomen, allowing for easier fetal movement and promoting muscular/skeletal development. Amniotic fluid swallowed by the fetus helps in the formation of the gastrointestinal tract. Contrary to popular belief, amniotic fluid has not been conclusively shown to be inhaled and exhaled by the fetus. In fact, studies from the 1970s show that in a healthy fetus, there is no inward flow of amniotic fluid into the airway. Instead, lung development occurs as a result of the production of fetal lung fluid which expands the lungs [4]. It also prevents the fetus from mechanical jerks and shocks. Amniotic fluid is removed from the mother by an amniocentesis procedure, where a long needle is inserted through the abdomen into the amniotic sac, using ultrasound guidance such that the fetus is not harmed. Amniocentesis is an abnormal procedure, and is only performed if there is a suspicion of health defects in the fetus, or if an early delivery of the fetus may be necessary, since there can be complications from the procedure. If warranted, fluid is collected between 16–42 weeks of fetal development, and 20–30ml of fluid are removed. Analysis of amniotic fluid can reveal many aspects of the baby's genetic health as well as the age and viability of the fetus. This is because the fluid contains metabolic wastes and compounds used in assessing fetal age and lung

maturity, but amniotic fluid also contains fetal cells, which can be examined for genetic defects. Amniotic fluid normally has a pH of 7.0 to 7.5 [5]. Because pH in the upper vagina is normally acidic (pH 3.8-4.5), a vaginal pH test showing a pH of more than 4.5 strengthens a suspicion of rupture of membranes in case of clear vaginal discharge in pregnancy. Other tests for detecting amniotic fluid mainly include nitrazine paper test and fern test.

One main test that is performed on amniotic fluid is the L/S ratio test (lecithin/sphingomyelin). This test is used to determine fetal lung maturity. Both lecithin and sphingomyelin are lung surfactants that are present in increasing amounts in the maturing fetus, though past week 33, sphingomyelin levels remain relatively constant [6]. Measuring a ratio of L/S of 2:1 or greater indicates that the fetus can be safely delivered, with functioning lungs. The aim of the study is to study AFI <5 cm as an appropriate threshold for pregnancy intervention to prevent adverse outcome of pregnancy, and it is a determining factor in perinatal outcome in high risk pregnancies. To compare caesarean rates between patients with AFI <5 cm and AFI >5 cm in high risk pregnancies.

Methods and Methodology

This study was conducted in department of gynaecology and obstetrics in Nizam Medical College, Hyderabad. It was a prospective, comparative study conducted over a period of two years from May 2014 to May 2016. A total of 100 patients were selected from department of gynaecology and obstetrics.

Inclusion Criteria

Patients with pregnancy induced hypertension, postdated pregnancy, intrauterine growth retardation, chronic hypertension with gestational age >34 weeks, pregnancy with cephalic presentation, and pregnancy with intact membranes.

Exclusion Criteria

Pregnancy with PROM, congenital abnormalities of fetus, polyhydramnios. In the study group, 50 high risk patients of >35 weeks pregnancy with an AFI <5cm. In the control group, 50 high risk patients of >35 weeks pregnancy with an AFI >5cm with the same complications of pregnancy. Ethical clearance was taken. In each patient, general physical examination, detailed history, obstetrical examination was done.

Results

The patients showed the mean age of this study population was 28.69±3.51 years and mean marriage duration was 2.89±3.12 years.

Table 1 shows that in study group the highest was in IUGR (asymmetrical) and in which frequency was 18 (36%), and the highest in control group was PD in which frequency was 17 (34%).

Table 2 shows that in group with AFI <5, there was high rate of non-reactive NST compared to group with AFI>5 (p<0.001).

Table 3 shows that the most common indication of LSCS was acute foetal distress followed by oligohydramnios and IUGR.

Table 4 shows that the characteristics of AFI<5 cm was highest for normal Apgar score at 5 mins>6 which was 22 (44%), AFI >5cm was highest for normal Apgar score at 5 mins>6 which was 46 (92%).

Discussion

In the present study, the patients showed the mean age of this study population was 28.69±3.51 years and mean marriage duration was 2.89±3.12 years. In study group the highest was in IUGR (asymmetrical) and in which frequency was 18 (36%), and the highest in control group was PD in which frequency was 17 (34%). In group with AFI <5, there was high rate of non-reactive NST compared to group with AFI>5

Table 1: Shows association of low amniotic fluid index and high risk pregnancy

Risk Factor	Study Group (n=50)		Control Group (n=50)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
IUGR(Symmetrical)	5	10	7	14
IUGR(Asymmetrical)	18	36	14	28
PIH	16	32	10	20
PD	10	20	17	34
Chronic hypertension	1	2	2	4

Table 2: Shows relationship of AFI with non stress list at admission (n=100) and comparison between induction rate and spontaneous labor

Characteristics	AFI <5cm	AFI >5cm	P Value	
Reactive	20	52	<0.001	
Non reactive	23	5		
Labour	Study Group (n=50)		Control Group (n=50)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Induced	10	20	20	40
Not induced	25	50	5	10
Spontaneous	15	30	25	50
Total	50	100	50	100

Table 3: Shows relation of AFI with mode of delivery (n=100) and indications for caesarean

Mode of delivery	AFI <5cm	AFI >5cm	P Value
LSCS	39	19	0.00
Normal delivery	11	31	
Indication of C-section	AFI <5cm	AFI >5cm	
Acute foetal distress	35.9%		10%
Non progression of Labour	2.5%		2.5%
Oligohydramnios, IUGR	30.5%		5.0%
Cephalopelvic disproportion, failure of induction	5.9%		7.0%

Table 4: Shows relationship of AFI and neonatal outcome (n=100)

Characteristics	AFI <5cm	AFI >5cm
Poor Apgar score at 5 mins<6	13 (26%)	2 (4%)
Normal Apgar score at 5 mins>6	22 (44%)	46(92%)
Perinatal morbidity required admission	10 (20%)	2 (4%)
Perinatal mortality	5 (10%)	0 (0%)

($p < 0.001$). The most common indication of LSCS was acute foetal distress followed by oligohydramnios and IUGR. the characteristics of $AFI < 5$ cm was highest for normal Apgar score at 5 mins > 6 which was 22 (44%), $AFI > 5$ cm was highest for normal Apgar score at 5 mins > 6 which was 46 (92%). Many other studies were also done related to this topic and the results are as follows;

Shazia Rashid *et al* [7]; conducted a study which correlated between Amniotic fluid index less than 5 cm ($AFI < 5$) and adverse perinatal outcome in high risk pregnancies. Perinatal outcome, rate of caesarean section and early intervention need were compared between the two groups. 77.3% women in study group underwent caesarean section as compared to 28% in control group to prevent adverse perinatal outcome. 60% babies in study group had APGAR score less than 6 at 1 minute compared to only 8% in control group. 61.4% babies in study group needed NICU admission compared to 10.7% in study group. AFI is predictor of adverse outcome for high risk pregnancies. The early recognition alerts an obstetrician to prevent perinatal catastrophe if timely intervention is done along with antepartum and intrapartum fetal monitoring.

Kumud Ashok Gupta *et al* [8]; conducted a study to find out the value of oligohydramnios in perinatal outcome and maternal outcome in pregnancies beyond 37 completed weeks. Labour was either spontaneous or induced in both study and control group. During labour intermittent auscultation of fetal heart rate was done to detect any signs of fetal distress. Artificial rupture of membranes was done in active phase of labour to notice the grade of liquor and progress of labour was monitored on a partogram. Mode of delivery and intrapartum complications were noted. At birth neonate was assessed using 5 minute APGAR score, birth weight was recorded and neonate who were admitted into NICU were followed until discharge.

Oligohydramnios i.e., $AFI < 5$ cm measured by ultrasonography in term pregnancies is associated with adverse perinatal outcome. The risks of meconium staining of liquor, intrapartum fetal distress, operative delivery and perinatal mortality are significantly higher in patients with $AFI < 5$ cm, compared to those with normal AFI. Determination of AFI can be used as an adjunct to other fetal surveillance methods. It helps to identify those infants at risk of poor perinatal outcome. Determination of AFI is a valuable screening test for predicting fetal distress in labour requiring caesarean section.

Magann EF *et al* [9]; compared amniotic fluid index (AFI) with the single deepest pocket in the

identification of actual abnormal amniotic fluid (AF) volumes. One hundred seventy-nine women with singleton pregnancies each woman subsequently had ultrasound-directed amniocentesis with dye-dilution and spectrophotometric calculation of actual AF volume. Actual AF volumes were low (under 5% by volume for gestational age) in 62 women, normal (5-95%) in 100 women, and high (more than 95%) in 17 women. An AFI up to 5 cm (sensitivity 10%, specificity 96%) and a single deepest pocket up to 2 cm (sensitivity 5%, specificity 98%) were similarly inadequate in identifying dye-determined low AF volumes. Likewise, AFI above 20 (sensitivity 29%, specificity 97%) and a single-deepest pocket above 8 cm (sensitivity 29%, specificity 94%) were poor in identifying dye-determined abnormally high volumes. There was no difference between AFI and single deepest pocket techniques for identifying truly abnormal AF volumes. Both techniques were unreliable for identifying true AF volumes.

Swathi Bhat *et al* [10]; evaluated whether oligohydramnios ($AFI \leq 5$) has any significance in the outcome of low risk pregnancies. Normal amniotic fluid index in pregnancy is one of the indicators of fetal well-being.

In a term pregnancy, oligohydramnios, a condition associated with $AFI \leq 5$, could be a sign of placental insufficiency. An association of low AFI with complications like pregnancy induced hypertension, consistently leads to poor fetal outcome. A need to deliver the fetus by caesarean section often arises. Occasionally one comes across a full-term pregnancy with $AFI \leq 5$ with no known high risk factors; this could lead to increased cesarean section rates. Thus, it becomes necessary to evaluate if $AFI \leq 5$ in the absence of other risk factors has any significance on obstetric outcome. Prospective case controlled study was done. Fifty women with term pregnancies and ($AFI \leq 5$) cm not associated with any other high risk factors were enrolled for the study. They were matched with fifty controls with normal AFI. Except for a slight increase in variable deceleration in the study group, no differences were noted with fetal heart rate recordings in NST. Decreased AFI was not associated with increased cesarean section rates, instrumental deliveries or meconium stained amniotic fluid. Severe asphyxia, NICU admission or perinatal mortality was not noted in either group. When a low risk pregnancy is associated with Oligohydramnios ($AFI \leq 5$), it does not have any deleterious effect on labor outcome or perinatal outcome.

Singhal SR *et al* [11]; compared the perinatal outcome in women with singleton term pregnancies having amniotic fluid index (AFI) < 5 cm to those

having AFI between 6 to 20 cm. It is a prospective comparative study which included a total of 100 women with singleton term pregnancy with cephalic presentation, divided into two groups of 50 each. Women in Group 1 had amniotic fluid index <5 cm and in Group 2, had AFI from 6-20 cm. Primary outcome measures were fetal distress, meconium stained amniotic fluid, Apgar score less than seven at five minutes and low birth weight. Secondary outcome measures were caesarean section, neonatal complications and admission in NICU. An AFI <5 cm was associated with significant high rate of induction of labor ($p < 0.001$), caesarean section ($p = 0.04$) and fetal distress ($p < 0.05$). Meconium-stained liquor ($p = 0.76$), Apgar score less than seven at 5 minutes ($p = 0.307$), low birth weight ($p = 0.130$) or NICU admission ($p = 1$) were comparable in the two groups. Low AFI (<5cm) at term is associated with significantly high rate of intrapartum fetal distress and caesarean section, though the neonatal outcome is not affected by the AFI levels.

Conclusion

From the present study, it was concluded that predictor of adverse outcome for high risk antepartum or intrapartum ladies is AFI, timely intervention is done along with antepartum and intrapartum fetal monitoring if early recognition alerts an obstetrician to prevent perinatal catastrophe and in neonatal care, there is need for improvement.

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