

A Hospital Based Prospective Study to Assess the Role of Amniotic Fluid Index (AFI) in Postdated Pregnancy and Perinatal Outcome

Avantica Agarwal¹, Ramdas Garg^{2*}, Vivek Kumar Shukla³

¹Junior Specialist, Department of Obstetrics & Gynaecology, District Hospital, Dholpur, Rajasthan, India

²Principal Specialist, Department of Obstetrics & Gynaecology, District Hospital, Dholpur, Rajasthan, India

³Medical Officer, Department of Obstetrics & Gynaecology, District Hospital, Dholpur, Rajasthan, India

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Abstract

Background: Oligohydramnios is associated with increased maternal morbidity, increased rate of induction of labour and caesarean section. Thus, this study was conducted to find the significance of amniotic fluid index in determining the maternal and perinatal outcome in pregnant women who came postdated to our department, admitted, and evaluated to find out the fetomaternal outcome with regards to amniotic fluid index in those patients. **Materials & Methods:** A hospital based prospective study done on 100 antenatal women whose gestational age is >40 weeks admitted in our department in district hospital Dholpur, Rajasthan, India during one year period. A study proforma was filled for each case. During delivery the colour of liquor was observed. Birth weight of the baby recorded. The rate of NICU admission is recorded. The perinatal outcome is followed up for 28 days after delivery. **Results:** 90 out of 100 antenatal postdated women (90%) gave birth to babies of weight 2.5 to 4 kg, and 10 out of 100 women (10%) gave birth to < 2.5 kg babies out of which (N=2/10) 20% of babies were in anhydramnios group, (N=1/10) 10% were in AFI < 3 group, (N=2/10) 20% were in AFI 3 to 8 group, and (N=5/10) 50% of them had AFI > 8. By Chi Square test, there was high significance between AFI in postdated birth weight of the baby and the P value is less than 0.05*. **Conclusion:** AFI is a predictor of fetal tolerance in labour and its decrease is associated with increased risk of abnormal heart rate and meconium-stained fluid. This is overcome by assessing AFI through ultrasonogram at the earliest in third trimester, biophysical profile scoring, and proper intrapartum fetal heart rate monitoring.

Keywords: AFI, Perinatal Outcome, Oligohydramnios, Postdated Pregnancy.

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Introduction

Amniotic fluid is an ultrafiltrate of mother's plasma. By the beginning of second trimester, the amniotic fluid volume becomes an extension of fetal extracellular space which diffuses through fetal skin. It is similar to fetal plasma and the main source of amniotic fluid is fetal urine. The human fetal urine production appears to be 1 to 2 lit/ day at term. Another source is fetal lungs which produces fluid that exits respiratory tract and enters amniotic compartment. AFI is inversely proportional to gestational age, and hence it is important to assess AFI to predict perinatal outcome in postdated pregnancies. The fluid is faintly alkaline with low specific gravity of 1.010, osmolarity of 250 mOsmol/litre-which is suggestive of fetal maturity.

Oligohydramnios is described as a condition with decreased amniotic fluid relative to gestational age. Its incidence is 2.3%. The incidence increases, upto 11% in postdated pregnancies. Assessment of amniotic fluid volume (AFI) by ultrasonogram is reliable. It is calculated as the sum of deepest vertical pocket in each quadrant of the uterus[1]. Manning et al[2], defined oligohydramnios as the condition when the largest pocket on ultrasound in its broadest diameter measured < 1cm. Subsequently they revised the criteria to single pocket measuring 2cm in both vertical and horizontal planes. Phelan et al[3], described amniotic fluid index by USG and explained that oligohydramnios is a condition when amniotic fluid index (AFI) was <= 5cm. But later Jeng et al[4], proposed a cut-off as 8 cm demonstrating increased incidence of meconium staining, caesarean delivery for fetal distress, abnormal fetal heart rate pattern and Apgar scores of 7 or less at one minute when AFI was < 8 cm.

Oligohydramnios is associated with increased maternal morbidity, increased rate of induction of labour and caesarean section. It is also

associated with adverse perinatal outcomes such as preterm delivery, low birth weight, fetal distress, meconium passage, low APGAR score, neonatal resuscitation and NICU admission. Oligohydramnios can also be an idiopathic finding in a woman who had low risk pregnancies and no medical or fetal complication. The long term sequelae of oligohydramnios is pulmonary hypoplasia, potter's syndrome, club foot, club hand and dislocation of hip. During labour, the predominant mechanical function of amniotic fluid is to provide a cushion for the umbilical cord, without which there would be compression of the cord during labour[5]. Decreased liquor are associated with increased incidence of meconium-stained liquor and abnormal fetal heart rate patterns during labour, thereby increasing operative deliveries. Thus, this study was conducted to find the significance of amniotic fluid index in determining the maternal and perinatal outcome in pregnant women who came postdated to our department, admitted, and evaluated to find out the fetomaternal outcome with regards to amniotic fluid index in those patients.

Materials & Methods

A hospital based prospective study done on 100 antenatal women whose gestational age is >40 weeks admitted in our department in district hospital Dholpur, Rajasthan, India during one year period.

Inclusion Criteria

- Pregnant woman in age group of 18-35 yrs
- Single live intrauterine gestation
- Cephalic presentation
- Gestational age >40 completed weeks
- Intact membrane

Exclusion Criteria

- High risk pregnancies like hypertension, diabetes, chronic renal disease, preeclampsia, connective tissue disorders, RH-negative.
- Gestational age <40 completed weeks.
- Multiple gestation
- Rupture membrane

*Correspondence

Dr. Ramdas Garg

Principal Specialist, Department of Obstetrics & Gynaecology, District Hospital, Dholpur, Rajasthan, India.

E-mail: rddholpur11garg@gmail.com

- Amnioinfusion

Method

Postdated pregnant patients fulfilling inclusion and exclusion criteria were admitted. Detailed history was obtained from the patient about the socioeconomic status, booked/unbooked, the patient’s age, obstetric code, gestational age, menstrual history, obstetric history. Obstetric examination carried out. Symphysio-fundal height measured. Fetal heart rates were recorded serially. It is reasonable to start antenatal surveillance between 41-42 weeks of gestation despite lack of evidences it improves the outcome. No single method has been recommended as superior in making of fetomaternal outcome.

Blood investigations – hemoglobin, blood grouping and typing, cell counts, blood sugar, urine analysis, VCTC, VDRL, USG, Doppler, CTG were done. Per Speculum and per vaginal examination was done to rule out draining per vaginum and confirmed intact membranes.

Ultrasound examination to monitor fetal wellbeing and assess amniotic fluid index is done by Phelan’s technique in which a curvilinear transducer was used. The abdomen was divided into four equal quadrants through the maternal midline vertically and an arbitrary transverse line between symphysis pubis and upper edge of uterine fundus. Transducer placement was parallel to maternal sagittal plane and perpendicular to maternal coronal plane. Image is frozen at the clear deepest pocket of amniotic fluid. This pocket was measured in a vertical direction. It is repeated in each of the four quadrants and summation of the four values gives the AFI of that patient and they are grouped according to their AFI.

Decision of delivery route was done as required. Some patients were already in spontaneous labour, some were subjected to induction of labour. If delivery is by caesarean section, the indication was recorded.

A study proforma was filled for each case. During delivery the colour of liquor was observed. Birth weight of the baby recorded. The rate of NICU admission is recorded. The perinatal outcome is followed up for 28 days after delivery.

Results

Maximum number of patients were getting admitted from a low socioeconomic status who lacked the knowledge about the maternal and perinatal morbidity and mortality associated with postdatism. In our study, there were 96% of women from lower socioeconomic class

(including socioeconomic class III, IV, V) indicating that they lack awareness about the risk of postdatism and oligohydramnios associated with it, thus increasing the perinatal outcome. 42 antenatal women (42%) were from the socioeconomic class III, followed by 35 women (35%) from the socioeconomic class IV, followed by class V- (19%), and then class II -(4%). There was almost no significance noted in the association between Socioeconomic status and amniotic fluid index in postdated pregnancies (table 1).

In our study, maximum number of antenatal women- 66% were in the age group of 21-25 years indicating that postdated women were mostly in the younger age group and (N=3/66) 4.54% of them had anhydramnios, (N=5/66) 7.58% had AFI < 3, (N=10/66) 15.15% with AFI 3 to 8, and (N=48/66) 72.72% with AFI > 8 (table 1). In our study, 62% of postdated women fell under the primigravida group, while only 38% comes under the multigravida group. Maximum number of post-dated primigravida (N=5/62, 8.06%) had AFI < 3, and maximum of postdated multigravida women (N=3/38, 7.90%) had AFI-NIL (Table 1).

Those women who presented to us from 40-41 weeks, majority of them had AFI > 8 (N=59/72) and they constituted 81.94%. In 41-42 weeks, group AFI < 3 constituted (N=2/21) 9.52%. In > 42 weeks group, anhydramnios is seen in almost (N=3/7) 42.85% (Table 1).

Many patients almost 40 cases presented during admission with spontaneous onset of labour while the other group were assessed using modified bishop’s score and induction of labour was done. When comparing mode of induction of labour and AFI by Chi Square test, it is highly significant with P value of less than <0.05* (Table 2).

90 out of 100 antenatal postdated women (90%) gave birth to babies of weight 2.5 to 4 kg, and 10 out of 100 women (10%) gave birth to < 2.5 kg babies out of which (N=2/10) 20% of babies were in anhydramnios group, (N=1/10) 10% were in AFI < 3 group, (N=2/10) 20% were in AFI 3 to 8 group. and (N=5/10) 50% of them had AFI > 8. By Chi Square test, there was high significance between AFI in postdated birth weight of the baby and the P value is less than 0.05*.

IUGR or Fetal Growth Restricted Babies were mostly associated with oligohydramnios in postdated pregnancies. Anomalies are more common among this group. They’re existed high significance of association by Chi Square test, between AFI and NICU admission rate in our present study (Table 3).

Table 1: Demographic variables association with different value of AFI

Variables	AFI				Total (N=100)	P-value
	>8 (N=75)	3 to 8 (N=15)	<3 (N=6)	Nil (N=4)		
Socioeconomic status						
II	3	1	0	0	4	>0.05
III	30	7	3	2	42	
IV	27	5	2	1	35	
V	15	2	1	1	19	
Maternal age (yrs)						
18-20 yrs	23	4	1	0	28	>0.05
21-25 yrs	48	10	5	3	66	
26-35 yrs	4	1	0	1	6	
Parity						
Primi	47	9	5	1	62	<0.05*
Multi	28	6	1	3	38	
Gestational age (weeks)						
40-41 wks	59	10	3	0	72	<0.05*
41-42 wks	14	4	2	1	21	
>42 wks	2	1	1	3	7	

Table 2: Onset of labour association with different value of AFI

Onset of labour	AFI				Total (N=100)	P-value
	>8 (N=75)	3 to 8 (N=15)	<3 (N=6)	Nil (N=4)		
Spontaneous	34	6	0	0	40	<0.05*
Induced	31	4	1	0	36	
LSCS	10	6	4	4	24	

Table 3: Perinatal outcome association with different value of AFI

Perinatal outcome	AFI				Total (N=100)	P-value
	>8 (N=75)	3 to 8 (N=15)	<3 (N=6)	Nil (N=4)		
Baby weight (Kg)						
2.5 to 4kg	70	13	5	2	90	<0.05*
<2.5 kg	5	2	1	2	10	
NICU admission						
No	68	9	2	0	79	<0.05*
Yes	7	6	4	4	21	

Discussion

The incidence of prolonged pregnancy is, inversely related to the pregnant women's socio-economic status and education. This means that's the lower her level of education or socio-economic status, the greater the likelihood she would have a postdated pregnancy. The risk of postdated pregnancy in the subsequent birth is increased two to three folds and is increased 4 times after two prior postterm pregnancies.

In our study maximum number of patients., 42% come from socioeconomic class III and the P-value by Chi square test is 0.776 and not significant which is comparable to the study by Tiparse et al where the lower socioeconomic class accounted to nearly 112 out of 200 patients, that is 58.5% of the population[6].

In India 20 to 25 yrs is the reproductive age group. Many studies agreed that advancing maternal age does not appear to influence the incidence of postdated pregnancy. In our study, maximum postdated women lie in the age group of 21-25 yrs and the P-value is 0.425 by Chi square test which is comparable with the study done by Tiparse et al 2017 and Gita guin et al 2011[6,7].The mean age in our study is 24.18 years, which is comparable to study done by Kaur T et al in which it was 25.8 years[8].

Similar to maternal age, parity does not appear to influence postdated pregnancy with maternal age held constant, prolonged pregnancies were encountered more frequently among primigravidas and women of high parity (>4). In present study maximum number of patients were primigravida (62%). This is similar to study done by Jagatia K et al in which 52% were primigravida[9].

Perinatal mortality and morbidity were increased in postdated pregnancy which could be reduced by timely and judicious induction of labour. Among 100 patients in our study, 40 patients went in for spontaneous labour. 36 patients (36%) went in for induction of labour and 24 patients (24%) were taken up for LSCS. The P value is 0.005 which is statistically significant. In a similar study conducted by Ahmar et al 2018, 44.44% patients went in for spontaneous labour, 42.22% patients went in for induction of labour, 13.33% patients were taken up for LSCS[10].

Amniotic fluid levels decrease by half when a pregnant patient reaches 42 weeks gestation. Usually, oligohydramnios is proportional to the severity of placental hypoperfusion and IUGR (Fetal Growth Restriction). The most likely cause of oligohydramnios in IUGR babies is decreased urine output[11].

Decreased amniotic fluid has been associated with multiple fetal risks like cord compression, musculoskeletal abnormalities such as facial distortion and clubfoot, intrauterine growth restriction, low birth weight, fetal distress, meconium aspiration syndrome, severe birth asphyxia, low APGAR scores, NICU admission, congenital abnormalities and stillbirths. Long standing oligohydramnios leads to pulmonary hypoplasia, potter's syndrome, club foot and hand and hip dislocation. Since oligohydramnios is associated with fetal growth restriction and adverse perinatal outcome, this study demonstrates the statistical significance.

Oligohydramnios is associated with intrauterine growth restriction in 15 babies (16.7%) in a study conducted by Bangal et al in 2018[12].

Postdated pregnancies carry a high risk of fetal morbidity and mortality thereby increasing the rate of NICU admissions. Obstetrical complications frequently associated with oligohydramnios were pregnancy induced hypertension, postdatism, intrauterine growth

restriction, fetal renal anomalies, prematurity and intrauterine death of the fetus.

In the present study 21 babies (21%) were admitted to NICU and was greater (100%) among the anhydramnios group when compared to 66.6% admissions in the AFI <3 group. Chi square test shows high significance value of 0.005 in the present study. In a similar study conducted by Ahmar et al in 2018, 18 babies (20%) were admitted to NICU[10]. Chate P et al in 2013[13] and Bansal et al in 2015[5], found 42% and 36% NICU admissions respectively in cases with oligohydramnios.

These babies are more prone for certain complications like intrapartum fetal distress, meconium aspiration syndrome, postmaturity syndrome, physiological jaundice, septicemia, umbilical sepsis, respiratory tract infections, birth asphyxia etc.

Ahmar et al in 2018 showed a perinatal mortality of 7.7% [10]. Thus oligohydramnios in postdated pregnancy is associated with increased maternal morbidity in terms of increase rate of induction of labour and caesarean section. It is also associated with adverse perinatal outcomes such as preterm delivery, low birth weight, fetal distress in labour, meconium passage, low APGAR score, neonatal resuscitation and NICU admission. All these necessitates the importance of this study to help in improving the perinatal as well as maternal outcome of these cases.

Conclusion

AFI is a predictor of fetal tolerance in labour and its decrease is associated with increased risk of abnormal heart rate and meconium-stained fluid. This is overcome by assessing AFI through ultrasonogram at the earliest in third trimester, biophysical profile scoring, and proper intrapartum fetal heart rate monitoring. Hence this study helped greatly in knowing the significant association between advanced gestational age and oligohydramnios.

References

1. Kolsoum Rezaie Kahkhaie, Fateme Keikha, Khadije Rezaie Keikhaie, Abdolghani Abdollahimohammad, Shahrbano Salehin. Perinatal outcome after diagnosis of oligohydramnios at term. Iran Red Crescent Med J. 2014; 16(5):1-3.
2. Manning FA, Hill LM, Platt LD. Qualitative amniotic fluid volume determination by ultrasound: Ante partum detection of intrauterine growth retardation. Am J Obstet Gynecol. 1981; 139:254-8.
3. Phelan JP, Smith CV, Small M. Amniotic fluid volume assessment with the four-quadrant technique at 36 to 42 weeks gestation. J Reprod Med. 1987; 32:540-2.
4. Jeng C, Jou T, Wang K et al. Amniotic fluid index measurement with the four-quadrant technique during pregnancy. J Reprod Med. 1990; 35:674-7.
5. Bansal D, Deodhar P. A Clinical study of: Maternal and Perinatal Outcome in Oligohydramnios. J Res Med Den Sci. 2015; 3(4):312-6.
6. Tiparse A et al. Ultrasound evaluation of pregnancies with oligohydramnios in third trimester and their fetomaternal outcome at tertiary care hospital. Int J Res Med Sci. 2017; 5(8):3292-3298
7. Guin G, Punekar S, Lele A, Khare S. A prospective clinical study of fetomaternal outcome in pregnancies with abnormal liquor volume. J Obstet Gynaecol India. 2011; 61:652-55

8. Tajinder K, Ruchika S. Feto-maternal outcome in pregnancies with abnormal AFI. IOSR-JDMS. 2016; 15(4):71-75.
9. Jagatia K, Singh N, Patel S. Maternal and fetal outcome in oligohydramnios- Study of 100 cases. Int J Med Sci Public Health. 2013; 2(3):724-727.
10. Ahmar R, Parween S, Kumari S, Kumar M. Neonatal and maternal outcome in oligohydramnios: a prospective study. Int J Contemp Pediatr. 2018; 5:1409-13.
11. Patrelli TS, Gizzo S, Cosmi E, Carpano MG, Di Gangi S, Pedrazzi G et al. Maternal hydration therapy improves the quantity of amniotic fluid and the pregnancy outcome in third-trimester isolated oligohydramnios: a controlled randomized institutional trial. J Ultrasound Med. 2012; 31(2):239-44.
12. Vidyadhar B. Bangal, Purushottam A. Giri, Bhushan M. Sali. Incidence of oligohydramnios during pregnancy and its effects on maternal and perinatal outcome. Journal of Pharmaceutical and Biomedical Sciences (JPBMS). 2011; 12(12):1-4.
13. Chate P, Khatri M, Hariharan C. Pregnancy outcome after diagnosis of oligohydramnios at term. Int J Reprod Contracept Obstet Gynaecol. 2013; 2(1):23-26.

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