Thai Journal of Obstetrics and Gynaecology
December 1996, Vol. 8, pp. 287-290

OBSTETRICS

The Amniotic Fluid Index in Normal Pregnant Women

Wirawit Piyamongkol MD,
Theera Tongsong MD,
Surached Apininbongkode MD.

Department of Obstetrics and Gynaecology, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand

ABSTRACT

Objective To evaluate the values of amniotic fluid index (AFI) by weeks of gestation.

Design Cross-sectional descriptive study.

Setting Department of Obstetrics and Gynaecology, Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University.

Subjects and methods Normal pregnant women between 16 and 40 weeks of gestation, had first antenatal visit during first trimester of pregnancy at Maharaj Nakorn Chiang Mai Hospital, between 1st July 1994 and 31st October 1995. All pregnancies were singleton with accurate gestational age. Pregnancies complicated with obstetric, surgical or medical conditions were excluded. The amniotic fluid index was measured by dividing uterus into four equal parts and then measuring amniotic fluid depth of each part vertically by using transabdominal sonography.

Main outcome measures Mean, standard deviation, minimum and maximum values of amniotic fluid index.

Results Total of 830 transabdominal sonographic measurements for the amniotic fluid index were performed. The mean ± standard deviation in centimetres were 10.9 ± 2.2 (7.7-16.0) at 16 weeks' gestation and increased progressively to 16.1 ± 3.7 (8.6-25.7) at 25 weeks' gestation. Then the AFI gradually declined to 11.2 ± 3.3 (6.0-20.0) at 40 weeks' gestation.

Conclusion The mean, standard deviation, minimum and maximum of AFI at each gestational age of normal pregnancies were determined. This data might be useful as a reference standard for AFI in Thai pregnant population.

Key words : amniotic fluid, index

Amniotic fluid volume is an important indicator of fetal well-being. Abnormalities of amniotic fluid volume are associated with poor pregnancy outcome.[1,2] The actual amount of amniotic fluid has been measured using the dye dilution technique.[3,4] But this invasive method,

which involves amniocentesis, is of limited clinical usefulness. With the advent of ultrasonography, a safe and noninvasive technique, has given rise to both subjective and semiquantitative methods of amniotic fluid estimation. The current sonographic technique are indirect measures and only provide estimates of amniotic fluid volume. There is a correlation between abnormal amniotic fluid volume and adverse fetal outcome,[1,2,5] but the reliability of subjective scales are depended on the operators. Phelan et al[6] described a four-quadrant technique, termed as the amniotic fluid index (AFI), for assessing the amniotic fluid volume. However, there is no report using this technique to describe the amniotic fluid index changes throughout pregnancy in Thai population.

This study was conducted to establish the normal range of the amniotic fluid index values by weeks of gestation in Thai pregnant population.

Materials and Methods

Individual AFI measurements were taken in normal pregnant women prospectively in Maharaj Nakorn Chiangmai Hospital, Chiang Mai University, during 1st July 1994 and 31st October 1995. The inclusion criteria were : normal singleton pregnancy between 16 and 40 weeks, reliable dates, early pelvic examination consistent with dates, no ultrasonographic abnormalities. Patients with twin gestation, ruptured membranes, fetal anomalies, suspected fetal growth disorders, abnormal neonatal outcome, maternal diseases were excluded from this study. The study was cross-sectional, only a single examination from each pregnancy was included.

Real-time ultrasound examinations were performed with an Aloka SSD-680 using a 3.5-MHz convex array transducer. With the patient in the supine position, the uterus was divided into four quadrants at all gestational ages (including 16-40 weeks). The linea nigra was used to divide the uterus into right and left, and the midpoint between the fundus and the symphysis pubis divided the uterus into superior and inferior portions. The transducer was placed on the patient's abdomen along the longitudinal axis and perpendicular to the floor. The sum of the maximum vertical pocket measured in each of the four quadrants was given in centimetres as the amniotic fluid index.

The data were stratified into gestational weeks and analyzed by microcomputer statistical programme. The mean amniotic fluid index and the minimum and maximum were calculated for each week of pregnancy.

Results

Eight hundred and thirty individual AFI measurements in normal pregnancy with certain date were taken from 16 to 40 weeks of gestation. The mean age of the pregnant women was 26.36 ± 4.59 (16-36) years. Among these pregnant women 47.7% were primigravida. The mean of the AFI values of all gestational age was 13.0 ± 10.5 cm. (range 5.0-25.7) The results were stratified by weeks of gestation and presented with the minimum, mean and maximum values (Table 1). From 16 to 25 weeks the AFI rose progressively from a mean of 11.1 ± 2.2 cm (range 7.7-16.0) to a maximum mean of 16.1 ± 3.7 cm. (range 8.6-25.7). The index then gradually declined to a mean of 11.2 ± 3.3 cm (range 6.0-20.0) at 40 weeks of gestation.

Discussion

Previous study using the dye dilution technique demonstrated a progressive rise in the amniotic fluid volume during pregnancy until the early third trimester, after that the amniotic fluid volume remained stable and then gradually

Table 1. Amniotic Fluid Index Value in Normal Pregnancy

Amniotic Fluid Index values (cm)					No. of Subjects
Weeks	Minimum	Mean	Maximum	Standard Deviation	
16	7.7	11.1	16.0	2.2	30
17	7.3	11.0	18.1	2.5	32
18	6.5	11.7	17.5	2.8	31
19	8.1	13.4	21.3	3.0	32
20	8.2	13.4	20.3	2.9	33
21	7.8	13.9	18.7	2.8	34
22	7.7	14.1	23.3	3.8	31
23	8.6	14.3	22.2	3.2	30
24	9.2	14.4	23.5	3.1	32
25	8.6	16.1	25.7	3.7	34
26	8.5	14.7	23.4	3.2	32
27	9.7	15.2	21.1	2.9	32
28	10.0	14.4	20.8	3.0	34
29	7.0	14.2	22.8	4.2	36
30	5.0	13.2	23.8	4.3	37
31	7.6	13.5	20.3	3.5	32
32	6.2	13.6	19.2	3.1	31
33	6.8	13.5	20.9	3.6	31
34	6.5	13.1	21.1	3.8	31
35	6.6	13.0	18.2	3.7	31
36	6.3	12.4	21.9	3.4	31
37	5.1	12.1	20.1	4.2	36
38	5.4	11.6	19.9	3.1	38
39	5.4	11.9	20.2	3.4	39
40	6.0	11.2	20.0	3.3	40

decreased until the postdate period.[3,4] The amniotic fluid index provided a semiquantitative analysis of amniotic fluid volume. The technique is simple to perform, safe, reproducible, and reliable. From the previous study, Gadd[7] found that the AFI values were paralleled to the values obtained by the dye dilution technique. As reported by Rutherford et al,[8] 92% of the values of the intraobserver variations from the mean were less than 2.0 cm, and 96% of the values of the interobserver variations from the mean were less than 4.0 cm. The efficacy of the AFI for predicting fetal morbidity and perinatal outcome has been proven by Chamberlain et al.[1,2] Rutherford et al[9] found an inverse relationship between the AFI and the occurrence of a nonreactive nonstress test, fetal heart rate decelerations, meconium-stained amniotic fluid, caesarean

section for fetal distress and low Apgar scores.

This prospective evaluation of the amniotic fluid index in normal pregnancy from 16 to 40 weeks showed the rising of the AFI from a mean of 11.1 ± 2.2 cm (range 7.7-16.0) at 16 weeks to a maximum mean of 16.1 ± 3.7 cm (range 8.6-25.7) at 25 weeks. Then the AFI gradually declined to a mean of 11.2 ± 3.3 cm (range 6.0-20.0) at 40 weeks. Phelan et al[10] and Jeng et al[11] found the same rise in the AFI up to 26 weeks followed by a plateau between 27 and 38 weeks and a gradual decline after 38 weeks. Gadd[7] showed a progressive rise of AFI until 30 weeks of gestation. Moore and Cayle[12] found an increase in the AFI from 12.1 cm at 16 weeks to 14.7 cm at 26 weeks and then progressively declined to 11.0 cm at 42 weeks of gestation. Hallak et al[13] showed a rise from a median of 10.3 cm at 15 weeks to 14.0 cm at 30 weeks of gestation, then the AFI gradually declined to a median of 9.1 cm at 40 weeks.

Phelan et al[6] used an AFI of 5.0 cm as the lower limit of normal and 20.0 cm as the upper limit. Jeng et al[11] defined the normal range as 8.0-24.0 cm, Moore and Cayle[12] and Hallak et al[13] designated the 5th and 95th percentiles for each gestational week as the limits of normal values.

Since we recruited only normal pregnancy into our study of AFI measurement, so we designated the minimum and the maximum values for each gestational week as the limits of normal values. The minimum and maximum values for our total study group from 16 to 40 weeks of gestation were 5.0 to 25.7 cm. Our study determined the normal amniotic fluid index for each gestational age and defined the upper and lower limits of normal values. These values might be useful in clinical practice in evaluating amniotic fluid volume during pregnancy.

References

1. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid volume. I. The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome. Am J Obstet Gynecol 1984 ; 150 : 245-9.
2. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid volume. II. The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome. Am J Obstet Gynecol 1984 ; 150 : 250-4.
3. Charles D, Jacoby HE, Burgess F. Amniotic fluid volumes in the second half of pregnancy. Am J Obstet Gynecol 1965 ; 93 : 1042-7.
4. Queenan JT, Thompson W, Whitfield CR, Shah SI. Amniotic fluid volume in normal pregnancy. Am J Obstet Gynecol 1972 ; 114 : 34-8.
5. Moore TR, Longo J, Leopold G, Gosink B, Cassola G. The reliability and predictive value of an amniotic fluid scoring system in severe second trimester oligohydramnios. Obstet Gynecol 1989 ; 73 : 739-42.
6. Phelan JP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment using the four-quadrant technique in the pregnancy between 36 and 42 weeks' gestation. J Reprod Med 1987 ; 32 : 540-2.
7. Gadd RL. The volume of the liquor amnii in normal and abnormal pregnancies. J Obstet Gynaecol Br Commonw 1966 ; 73 ; 11-2.
8. Rutherford SE, Smith CV, Phelan JP, Kawakami K, Ahn MO. Four-quadrant assessment of amniotic fluid volume. Interobserver and intraobserver variation. J Reprod Med 1987 ; 32 : 587-9.
9. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The four quadrant assessment of amniotic fluid volume : An adjunct to antepartum fetal heart rate testing. Obstet Gynecol 1987 ; 70 : 353-6.
10. Phelan JP, Ahn MO, Smith CV, Rutherford SE, Anderson E. Amniotic fluid index measurements during pregnancy. J Reprod Med 1987 ; 32 : 601-4.
11. Jeng CJ, Jou TJ, Wang KG, Yang YC, Lee YN, Lan CC. Amniotic fluid index measurement with the four-quadrant technique during pregnancy. J Reprod Med 1990 ; 35 : 674-7.
12. Moore TR, Cayle JE. The amniotic fluid index in normal human pregnancy. Am J Obstet Gynecol 1990 ; 162 : 1168-73.
13. Hallak M, Kirshon B, Smith EO'Brian, Cotton DB. Amniotic fluid index. Gestational age-specific values for normal human pregnancy. J Reprod Med 1993 ; 38 : 853-6.

Thai Journal of Obstetrics and Gynaecology
December 1996, Vol. 8, pp. 291-294

OBSTETRICS

Safety and Tolerance of Zidovudine Treatment in Late Pregnancy among HIV-1 Infected Parturients in Ramathibodi Hospital

Surasak Taneepanichskul MD, MPH,*
Sayomporn Sirinavin MD,**
Winit Phuapradit MD, MPH,*
Kamhaeng Chaturachinda MB, Ch B, FRCOG.*

* *Department of Obstetrics and Gynaecology,*

** *Department of Paediatrics, Faculty of Medicine, Ramathibodi Hospital, Bangkok 10400, Thailand*

ABSTRACT

Objective To evaluate safety and tolerance of asymptomatic HIV-1 positive parturients who treated with zidovudine in late pregnancy.

Design Prospective descriptive study.

Setting Department of Obstetrics and Gynaecology and Department of Paediatrics, Faculty of Medicine, Ramathibodi hospital, Mahidol University.

Subjects Thirty-five cases of HIV-1 positive pregnant women who attended antenatal care between January 1995 and June 1996.

Results The mean age of study group was 25.8 ± 4.6 years. Most of them were primigravida and lived in Bangkok. The mean duration of zidovudine intake was 24.6 ± 9.5 days with complete treatment 91.4%. Only 20% of them had side effects and most common was nausea and vomiting. The mean birthweight of newborns was 3,004.0 ± 297.4 grams and no asphyxia was observed. Most of them were delivered by normal delivery. No adverse effect and postpartum morbidity were demonstrated. No HIV-1 genome which was performed by PCR technique was detected in peripheral blood of newborns.

Conclusion Zidovudine treatment in late pregnancy is safe and tolerant. It could be applicable in a clinical setting of developing countries. However, the efficacy of this regimen should be further studied.

Key words : HIV, Zidovudine, late pregnancy

The number of infant infected with HIV via vertical transmission route is increasing with the ever expanding AIDS pandemic. The prevalence rate of Thai HIV-1 infected pregnant women was recently reported as 2% is 1993.[1] Prevention of vertical transmission is very important. According to AIDS Clinical Trial Group protocol 076 (ACTG 076), zidovudine (ZDV) use in HIV infected pregnancy can reduce vertical transmission rate from 25.5% to 8.3%.[2] However, regimen of ZDV use in ACTG 076 should not be applicable to developing countries because of its cost and complexity. Department of Obstetrics and Gynaecology,Faculty of Medicine, Ramathibodi Hospital has introduced ZDV treatment in late pregnancy to prevent vertical transmission among HIV-1 infected parturients since January 1995. The objective of this study was to evaluate safety and tolerance of ZDV use in late pregnancy.

Materials and Methods

Between January 1995 and June 1996, 35 cases of eligible HIV-1 infected pregnant women attending antenatal care at Ramathibodi Hospital were enrolled to the study willingly. They were diagnosed during a voluntary test for HIV and confirmed with Western blot technique. The eligible inclusion criterias were haemoglobin > 10 g/dL, platelet count > 100,000 /cu.mm. and negative for urine albumin and sugar. The exclusion criterias were ZDV treatment before and during this pregnancy, symptomatic HIV infection, allergy to ZDV and developed complications during this pregnancy. Each woman gave written informed consent for her participation. Because of our booking system for antenatal care, all of them were recruited before 20 weeks of gestational age and had regular follow up according to our schedule. The ZDV protocol consisted of ZDV 250 mg orally twice daily which started from gestational age 36 weeks until labour. Their compliances were observed by pill counts. No ZDV was given during intrapartum period and in newborns. No breastfeeding was recommened to all parturients. They were appointed to follow up at 6 weeks after delivery for postpartum check up and family planning. The newborns were evaluated at birth and their peripheral blood specimen were tested for HIV genome by previously described PCR technique,[3] using HIV-1 pol primer JA 17, 18, 19, 20 nested PCR. Statistical values were mean, standard deviation and percent.

Results

From January 1995 to June 1996, 35 cases of eligible asymptomatic HIV-1 infected pregnant women were recruited to the study. The characteristics of the pregnant women were shown in table 1. The mean duration of ZDV treatment was 24.6 ± 9.5 days (range 5-40 days). Based on pill count, 91.4% of HIV-1 infected parturient had complete ZDV treatment and most of them did not had any serious side effects. The most common side effect was nausea and vomiting (Table 2). The mean duration of rupture membranes and labour were 6.3 ± 4.9 and 12.1 ± 6.3 hours respectively. The mean birthweight was 3,004 ± 297.4 grams with maximum 3,560 grams and minimum 2,290 grams. The mean Apgar score at 1 minute and 5 minute were 8.5 ± 1.4 and 9.7 ± 0.3 respectively. Most of them were delivered by normal delivery (Table 3). No HIV-1 genome was detected from peripheral blood of newborns at birth. No congenital anomaly, birth asphyxia and stillbirth were observed in this study. No maternal morbidity was observed during the postpartum period.

Table 1. Characteristics of HIV-1 positive pregnant women

Characteristics (N = 35)	
Mean age (year)	25.8 ± 4.6
Mean weight at delivery (kg)	61.9 ± 7.7
Mean height (cm)	154.1 ± 5.7
Mean haemoglobin (g/dL)	11.4 ± 1.2
Mean ANC (visit)	8.5 ± 2.3
Gravida	
1	23(65.7%)
>1	12(35.3%)
Address	
Bangkok	30(85.7%)
Other	5(14.3%)

Table 2. Compliance and side effects of ZDV use

Variables (N = 35)	Number	Percent
Compliance		
Complete ZDV use	32	91.4
Incomplete ZDV use	3	8.6
Side effects		
Nausea/Vomiting	4	11.4
Headache	3	8.6
None	28	80.0

Table 3. Type of delivery

Type of delivery	Number	Percent
Normal	27	77.1
Forceps extraction	1	2.9
Vacuum extraction	2	5.7
Caesarean section	4	11.4
Breech delivery	1	2.9
Total	35	100.0

Discussion

Using sensitive techniques of viral detection (PCR and viral culture), new working definitions for early versus late infection were proposed : an early (in utero) infection would correspond to the detection of HIV-1 genome by PCR or viral isolation within 48 hours of birth, a late (intrapartum) infection would correspond to negative PCR/viral isolations during the first week of life and becoming positive after day-7 in nonbreastfed infants.[4]

Administering ZDV to the mother and infant following ACTG 076 protocol regimen is proved to reduce vertical transmission.[2] Later studies also confirmed these results.[5-9] However, in developing countries, ACTG 076 protocol presents great challenges because of its cost and complexity. Thus, several simpler interventions are being explored including short course of ZDV treatment. We have conducted a study of oral ZDV administered in late pregnancy to HIV-1 infected pregnant women since January 1995. From our previous study it was revealed that most of them accepted to have ZDV treatment in pregnancy in order to reduce vertical transmission.[10] However, safety and tolerance of ZDV use in late pregnancy need to monitor and evaluate. From the study, it was shown that ZDV treatment in late pregnancy had better compliance with less side effects and morbidity when it was compared to ACTG 076 protocol. There were no any adverse effects on newborns who exposed to zidovudine during late pregnancy. Moreover, we could not detect HIV-1 genome with PCR technique in the newborns. This evidence suggested that zidovudine treatment in late pregnancy could prevent in utero transmission.

In summary, zidovudine treatment in late pregnancy is safe, well accepted and tolerated by HIV-1 infected parturients. It is applicable in a clinical setting. Although these results are preliminary, this regimen seems to reduce in utero transmission. However, further study should be conducted by following these newborns up to 18 months to assess its efficacy and long term side effects.[2]

References

1. Taneepanichskul S. Prevalence of HIV-1 positive mothers in Thailand 1990-1993. J Obstet Gynaecol 1995; 21 (suppl 1) : 207.
2. Connor EN, Sperling RS, Gelber R, Keiseler P, Scott G, O' Sullivan HJ, et al. Reduction of maternal infant transmission of human immunodeficiency type 1 with zidovudine treatment. N Eng J Med 1994 ; 331 : 1173-94.
3. Kunakorn M, Wichukchinda N, Raksakiat K. Screening of HIV-1 proviral DNA using simple protocol polymerase chain reaction in Thai blood donors. AIDS 1993 ; 7 : 1681-2.
4. Bryson YJ, Luzuriaga K, Sullivan JL, Wara DW. Proposed definition for in utero versus intrapartum transmission of HIV-1. N Eng J Med 1992 ; 327 : 1246-7.
5. Matheson PB, Abrams EJ, Thomas PA, Hernan MA, Thea DM, Lambert G, et al. Efficacy of antenatal zidovudine in reducing perinatal transmission of human immunodeficiency virus type 1. The New York City Perinatal HIV Transmission Collaborative Study Group. J Infect Dis 1995 ; 172 : 353-8.
6. Frenkel LM, Wagner LE, Demeter LM. Effects of zidovudine use during pregnancy on resistance and vertical transmission of human immunodeficiency virus type 1. Clin Infect Dis 1995 ; 20 : 1321-6.
7. Rouzioux C. Prevention of maternal HIV transmission. Practical guidelines. Drugs 1995 ; 49 (suppl 1) : 17-24.
8. Boyer PJ, Dillon M, Navaie M. Factors predictive of maternal fetal transmission of HIV-1. Preliminary analysis of zidovudine given during pregnancy and/or delivery. JAMA 1994 ; 271 : 1925-30.
9. Kumar RM, Hughes PF, Khurranna A. Zidovudine use in pregnancy : a report on 104 cases and the occurrence of birth defects. J Acquir Immune Defic Syndr 1994 ; 7 : 1034-9.
10. Taneepauichkul S, Phuapradit W, Chaturachinda K, Khanacharoen A, Nonsrichai C. A survey of acceptability of zidovudine treatment in pregnancy among HIV-1 positive parturients. Thai J Obstet Gynaecol 1996 ; 8 : 105-9.