ASSESSMENT OF AMNIOTIC FLUID INDEX IN NORMAL PREGNANCY AT A TERTIARY CARE HOSPITAL SETTING

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Background: Ultrasound assessment of amniotic fluid has important implication in obstetrics care and it has become an integral and important component of pregnancy assessment. Changes in amniotic fluid volume are associated with adverse outcome. Excess volume is associated with foetal anomalies and aneuploidy and less volume is associated with Intra Uterine Growth Retardation, renal anomalies in the second trimester. The objective of this study was to establish a normative scale of Amniotic Fluid Index (AFI) throughout gestation in uncomplicated singleton pregnancies, and to identify the lower and upper limits for each gestational week. **Method**: A prospective cross-sectional study conducted in a private tertiary care Hospital from Jan 2004 to April 2005. Amniotic fluid index was calculated in 400 women attending the antenatal clinic. The gestational age of these women range from 20–40 weeks. Women with foetal anomalies, Pregnancy Induced Hypertension, Diabetes Mellitus and other maternal complication were excluded from study. The median, mean, 5th, 50th, and 95th percentile were calculated for each gestation and these values are compared with other studies. **Results:** The amniotic fluid index observations from regression equation curve were stratified in week-specific normative curves. The mean of preterm was significantly greater than mean of term gestation (p<0.05). Our median reached peak at 27th week of gestation another peak at 30–31 week. The values then begin a gradual fall to 40 weeks gestation. **Conclusion** Gestational age specific values of AFI were established, showing significant trends of changes in the amniotic fluid volume with gestation.
Keywords: Amniotic fluid index, normal pregnancy, Pakistan

INTRODUCTION

Ultrasound assessment of amniotic fluid has important implication in obstetrics care and it has become an integral and important component of pregnancy assessment. Changes in amniotic fluid volume is associated with adverse outcomes for example excess. volume is associated with foetal anomalies and aneuploidy and less volume is associated with Intra Uterine Growth Retardation, renal anomalies in the second trimester.[1.]

Later in pregnancy the estimation of Amniotic fluid volume is an integral component for antenatal testing for the assessment of foetal health, perinatal health such as foetal distress, meconium passage, operative delivery and foetal death etc.[1] It is therefore necessary that normal values of amniotic fluid across the gestational age should be established.

The potentially most accurate methods to determine amniotic fluid volume are measurement at the time of hysterectomy[2] or amniocentesis with the dye dilution and subsequent spectrophotometer analysis[3]. These methods are invasive and time consuming and require laboratory support. Because of the difficulties involved in these methods, ultrasonic measurements are currently used to evaluate amniotic fluid volume. The ultrasonic methods which are used to measure amniotic fluid volume are Amniotic Fluid Index (AFI)[3], Largest Vertical Pocket (LVP) measurement[5], Two diameter pocket measurement[4], Largest Transverse Pocket (LTP) maximum transverse[5].

The AFI is semiquantative analysis of AFI described first by Plelen in 1987.[3] The technique is simple, acceptable, reproducible and also readily usable even by people with limited experience of ultrasound technique. Using Moore and Cayle technique the AFI is obtained with the patient in the supine position. The abdomen is divided into four quadrants. Uterine quadrants are defined sagittaly by linear nigra for right and left, and the umbilicus for upper and lower. The ultrasound probe is positioned parallel to the patients sagittal plane. Measurement of the largest vertical pocket of Amniotic fluids in the four areas are taken. The measurement in each pocket should be clear of umbilical cord and foetal small parts. AFI is the sum of these four quadrants.[6]

Several studies on AFI has demonstrated serial changes of mean AFI values weekly with the threshold for oligohydromnios and polyhydromnios during pregnancy.[6–8]

The values described by Moore and Cayle[6] are used worldwide. The cut-off values for the AFI commonly used are an AFI of 0–5 cm labelled as low fluid, 5.1 to 8 cm as normal fluid and greater than 8 cm as high fluid value. Rutherford *et al*[9] and Phelan *et al*[3] proposed a range of normal AFI of 8 to 18 cm. However as AFI values may be affected by the difference of race and environment, care should be taken when previously established AFI values are applied to pregnant women with different racial and environmental backgrounds.

The objectives of the present study were to establish the normal range of gestation specific

reference range of amniotic fluid index among uncomplicated pregnant women and to compared our AFI values with those previously published in literature.

MATERIAL AND METHODS

This is a cross sectional observational study conducted in 400 women attending the antenatal clinic at Kharader General Hospital, Karachi from March 2004 to August 2005. These women came for routine checkups. Obstetric history of all women was taken on a prescribed form.

Gestation age was estimated on the basis of last menstrual period and early ultrasound scan. Inclusion criteria were singleton gestation with no foetal anomalies and gestational age between 20–41 weeks. No women with medical (chronic hypertension, diabetes mellitus, collagen vascular disease, twins, haemoglobinopathy) or obstetric (preterm labour, preterm rupture of membrane, gestational diabetes, pre eclampsia, intra-uterine growth retardation, gestational age <16 weeks) was included in the study.

Each patient underwent a single ultrasonic examination. All AFI estimation was done by the same ultrasonologist and a single obstetrician to eliminate inter-observational error.[10] The technique of Moore and Cayle[6] were used to measure amniotic fluid index.

Patients were examined in supine position; the uterus was divided into four quadrants. The ultrasound probe kept perpendicular to the plane of floor and longitudinally with maternal spine.

Vertical depth of the largest clear amniotic fluid pool was taken which was free of umbilical cord or foetal limbs. The pool measurement was done in cm from each quadrant of the uterus. AFI estimated by adding four quadrant depths. Ultrasonic examination was performed using ultrasonic 3000 with 3.5 MHz linear transducer.

RESULTS

Of the 400 of our patients undergoing routine scan and AFI measurement, 134 were primigravida and 266 were multigravida. Age of our subjects ranged from 18 to 40 years.

Table-1 illustrates percentile in the five groups and in patients with preterm and term gestation. The AFI values were higher in the preterm gestations compared to those obtained in term gestation (p<0.0001). The mean AFI was 12.8 cm. The data was normally distributed with mean and median almost the same. The 5th percentile was taken as lower limit and 95th percentile was taken as upper limit of normal AFI. We observed 7 cm AFI as lower limit of normal in our subjects and 18 cm AFI as upper limit of normal at term. For preterm gestational period the upper and lower limits of normal AFI were 10 cm and 20 cm respectively—higher than that in the term gestation.

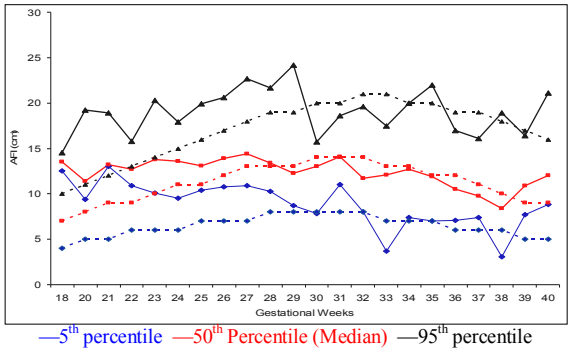
Table-1: The 5th 50th and 95th percentile values of AFI in 5 groups of patients

GA	Patients	Percentile		
		5th	50th	95th
Up to 20	7	9.40	12.50	19.20
21–25	52	9.63	13.10	19.25
26–30	137	10.18	13.00	20.15
31–35	113	7.86	12.20	18.30
36–40	91	7.22	10.70	17.18

Figure-1 illustrates the changes in AFI values from 8–40 weeks. The trend line displayed shows that AFI value reaches its peak at 26 week and again a peak at 31 week with gradual decline down near term.

Figure-2 illustrates the mean, 5th and 95th percentile curves in the present study in comparison with percentile curves of the American study by Moore *et al.*[6]

Figure-1: Trend line of amniotic fluid index showing two peaks



—5th percentile —50th Percentile (Median) —95th percentile
Solid line=Present study, Dotted line=American Study

Figure-2: Comparison of percentile curves of amniotic fluid index between American and Pakistani women

DISCUSSION

In the present study the gestation specific percentage values of amniotic fluid index has been formulated for the uncomplicated pregnant Pakistani women. The study shows that AFI rises to peak at 27 week and, unlike all other studies, shows another peak at 30–31 week. The values then begin a gradual fall to 40 weeks gestation.[11,12] Phelan[3] and Moore[6] founded a plateau between 27 and 38 week gestation before declining. In

our study the absolute values differed from the established reference ranges in other populations (Figure-2). The variability could arise not due to number of patients studied, techniques or ultrasound machine but also because of racial differences, maternal size and intrauterine volume.

Our results suggest that we could define mild oligohydromnios or alarm points at 40 week when AFI is less than 7 cm. This is similar to as described by Moore and Calye.[6] The alarming values is 6 cm in a study done on Indian women[11] while, in Chinese population the lower limit is described as 5.6 cm[10].

Salahuddin *et al*[15] reported peak at 30 week in their study from Japan, the study on Indian women[11] suggests peak at 27 week which is comparable to our study. Other investigators found the same rise in AFI to peak at 26 weeks gestation followed by a progressive decline to 42 weeks.[13,14]

The similarity of this study to previous ones is only in the trend but the absolute values differ from the established reference ranges in the other populations.

CONCLUSION

The results of present study are similar to those described for Caucasian but slightly higher than those for Indian and Chinese women. We define 7 cm as lower limit of normal and 18 cm as upper limit of normal. For preterm gestation the upper and lower limits of normal were 9 and 19 cm respectively and are higher than at term gestation. The AFI is a useful non-invasive assessment of the amniotic fluid volume. There is need for large multi-centre studies to give a wider outlook of this reference range in Pakistani women.

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