The Amniotic Fluid Index In Normal Human Pregnancies In Southwestern Nigeria

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Abstract

Objective: To establish the normal range of amniotic fluid index (AFI) across gestation, to also determine the gestational specific boundaries of normal AFI for each week and to construct a normal curve of AFI in the studied population.

Design: Cross sectional prospective study.

Settings: Obafemi Awolowo University Teaching Hospital ILE IFE.

Subjects: 500 pregnant women referred for routine antenatal ultrasound scan from15 weeks to 41 weeks were recruited.

Results: Our study showed a steady rise in AFI from 15 weeks to 22 weeks with a subsequent drop at 25 weeks before rising gradually again and reaching maximum value at 41 weeks.
There was no significant difference between the main AFI for both term and preterm pregnancies in the study population

Conclusion: The reference range of AFI used in clinical practice should be based on values obtained from the local population. The range in our study between 15 and 40 weeks is 7.9 cm to 27.3cm. These values obtained will assist the obstetrician in our environment in adequately assessing Amniotic fluid volume in pregnancy and improving fetomaternal care there by reducing perinatal morbidity and mortality.

INTRODUCTION

The amniotic fluid is a liquid produced by the fetus, which surrounds the fetus throughout pregnancy[1]. It acts mainly as protection for the fetus and provides an even temperature, cushions external trauma and allows free movement necessary for normal development of the lungs[1].

In labour the even distribution of fluid makes it possible for the force of uterine contraction to be applied early on the cervix when the presenting part is high[2]. The volume of fluid present is an important indicator of fetal condition if less than 2cm in two perpendicular plane is seen then oligohydramnios may be suspected[2].the presence of a pool of more than 8 cm suggest a diagnosis of polyhydramnios and may be associated with fetal anomalies or gestational diabetes. The amniotic fluid index is a semi- quantitative measurement of amniotic volume and it is determined by the vertical height of the deepest pocket in each quadrant of the uterus and summing the four measurement, umbilical and fetal parts are excluded from the area.

Amniotic fluid index (AFI) is a non invasive technique of estimating amniotic fluid volume and its reproducibility and reliability has been demonstrated. It is fast, inexpensive and has high sensitivity and positive predictive value [4]. The purpose of this study was to establish the normal range of amniotic fluid index in this environment.

MATERIALS AND METHODS

STUDY AREA/ SAMPLE METHODS

The study was carried out at the DEPARTMENT OF RADIOLOGY Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), ILE IFE which situated in the southwestern part of Nigerian.

A total of 500 pregnant women referred for routine antenatal ultrasound scan from 15weeks to 41 weeks who were normal

and were either sure of their last menstrual period or had first trimester ultrasound scan done to confirm gestational age. Those that were excluded from the study were patients unsure of their dates, patients with multiple gestations and patients presenting with fetomaternal pathology or complication e.g. pregnancy induced hypertension, gestational diabetes , premature rapture of membranes etc . It was a cross sectional study as only a single examination from each pregnancy was included. The ultrasound was performed by a single sonogist using the sonnoace 3,200 by medson with a 3.5 MHz, curvilinear transducer. The subjects were positioned supine and the abdomen was exposed to reveal the extent of the gravid uterus.

The uterus was viewed as four equal quadrant using the umbilicus and the linear nigra as land marks[3] .

After applying the coupling gel the transducer was maintained perpendicular to the gravid uterus and parallel to the maternal spine. The vertical depth of the largest clear amniotic fluid free of umbilical cord or fetal limbs were measured for each quadrant . AFI is the sum of all the vertical depths in the four quadrant expressed in centimeters.

ETHICAL CONSIDERATION

The ethical clearance for the study sought and obtained from the ethical committee of OAUTHC ILE IFE .

ANALYSIS OF RESULTS

Results were analyzed using the SPSS version 11 and Microsoft excel.

RESULT

A total of 500 women were examined with age range 15years to 44years and mean age range of 28 years. The minimum parity of women in the study was 0 while the maximum parity was 9.

The total mean AFI for preterm pregnancy (<37 weeks) was 154.13 + 40.79 pregnancies and term pregnancies (>37 weeks gestation) was 153.22 ± 43.52. (Table 1)

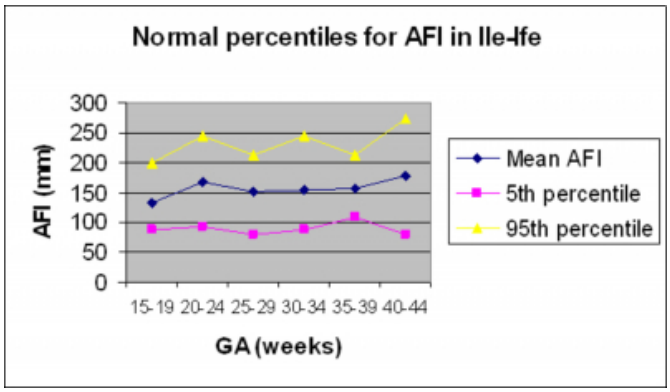
Figure 1

Table 1: Group statistics/independent sample test

	Preterm (<37 weeks)	Term (≥37 weeks)	T-test	Comment
Mean AFI	154.13 (n=449)	153.22 (n=51)	T=0.965 (P>0.05)	Not significant

The study showed AFI rising from 15 weeks to 22 weeks then dropping at 25 weeks before rising gradually again and reaching maximum value at 41 weeks (Fig 1).

Figure 2



The difference in mean AFI between the term and preterm pregnancy showed no significant difference. There was no significant difference {P> 0.05 (± = 0. 965)} between the mean AFI for both term and preterm pregnancies in the study population (Table 2).

Figure 3

Table 2: Gestational Specific Afi In The Study Population

GA weeks	(No of Subject)	Mean AFI(mm)	5th percentile	95th percentile
15 – 19	54	131.78	88	198
20 – 24	86	166.41	92.75	245.55
25- 29	128	152.1	78.8	213
30 – 34	140	154.69	87	245.45
35 – 39	82	155.37	108.15	212
40 – 44	10	178.4	79	273

DISCUSSION

Amniotic fluid volume assessment is an integral part of the antenatal evaluation of pregnancy at risk for an adverse pregnancy out come. Amniotic fluid volume can be measured by dye dilution techniques and by direct qualification at the time of caesarean delivery. Both methods are invasive, require laboratory support and, when measured at the time of operative abdominal delivery, cannot be used serially to evaluate high risk pregnancies[1].

The limitation of direct amniotic fluid volume measurement led to the use of ultrasound measurement of fluid volume estimation carried out via the amniotic fluid volume[2].

In very early pregnancy amniotic fluid is derived from the maternal plasma. Later it receives its major contribution from the fetus. After 20 to 22 weeks the Amniotic fluid is formed increasingly from fetal urine and lung fluid.

The transient drop at 22 weeks observed in our study is most probably due to transition of amniotic fluid formed from maternal plasma, being taken over by fluid formed from fetal urine and lung secretion, that is maternal plasma secretion of amniotic fluid wanes and fetal urine and lung secretion picks up gradually. After 25 weeks, there was a gradual rise in AFI reaching a peak at 41 weeks.

After 22 weeks, amniotic fluid is formed increasingly from fetal urine and lung fluid and as the fetus grows so also the urine and lung secretion also increases, getting to maximum value at 41 weeks. After 22 weeks, amniotic fluid is formed increasingly from the fetal urine and lung fluid and as the fetus grows, so also the urine excreted by the fetus and lung secretion also increases getting to maximum value at 41 weeks.

After 41 weeks the fetal growth wanes, so also fetus metabolic activity and placenta function also decreases, hence there is a corresponding significant reduction in amniotic fluid volume.

Our study result is also in agreement with Brave and Wolf[12] who reported that amniotic fluid volume is not significantly different between 22 weeks and 39 weeks of gestation.

Using a cross sectional model, Moore and Cayle [3] reported the AFI is statistically different from each weeks of gestation in contrast to our findings. This variation observed is due to racial and ethnic variation in fetal growth which is why amniotic fluid index should be referenced in different community.

The reference range of AFI used in clinical practice should be based on data obtained from local population .Phelan used AFI of 5 to 20cm as the range of normal gestation for study carried out between 36 weeks and 40 weeks.

The range in our study carried out between 15 weeks and 40 weeks was 7.9cm to 27.3cm. Amniotic fluid index is a useful noninvasive assessment of amniotic fluid volume. Our study determined the normal value of AFI across gestation in normal pregnancies.

The values obtained will assist the obstetrician in this environment in adequately assessing amniotic fluid volume in pregnancy and improving feto maternal care, there by reducing perinatal morbidity and mortality.

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