
The Normal Standards of Anterior Fontanel Size in Iraqi Neonates

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Abstract

Background: The diagnosis of abnormal anterior fontanel requires an understanding of the wide variation of normal.

Objectives: The study is an attempt to establish the normal value for anterior fontanel size of normal full term infants in Baghdad.

Method: Prospective study done in Central Teaching Hospital for Children from Jan.1997 to Jan.1998. The sample consists of 200 full term infants, 100 male & 100 female, who attended vaccination center. Anterior fontanel size measurement was taken using methods advised by Popitch & Davis.

Result: The mean size of AF for boys was higher than that of girls & the difference was significant ($p=0.004$). The mean value for AF area was 176.26 ± 53.39 (range 50-255) mm^2 in boys & 160.32 ± 46.78 (50-270) mm^2 in girls (the difference was not significant; $p=0.113$). The gestational age of infants ranged between 38&40 weeks, the mean birth weight of boys was 3228 ± 0.475 gms & the mean birth weight of girl was 3256 ± 0.530 gms. There is no effect of body weight, or head circumference on the size of anterior fontanel.

Key Words: AF (anterior Fontanel), NB (Newborn).

Introduction:

The word "Fontanel" is derived from the Latin "fonticulus" & the old French "Fontine", meaning a little fountain or spring^[1,2].

An infant has two fontanels at birth, a diamond-shaped anterior fontanel that situated in the midline at the junction of the coronal & sagittal sutures & the posterior fontanel between the intersection of the occipital & parietal bones that may be closed at birth or at most, admit the tip of a finger.^[3]

The AF varies greatly in size, but the usual measurement approximately $2 \times 2 \text{ cm}$ ^[3].

The AF continues with the sagittal suture that passes from the posterior angle towards the occiput & the coronal sutures that proceed laterally towards the ears. Their position is identifiable but there is not usually a palpable gap between the bones ^[4].

The diagnosis of abnormal fontanel requires an understanding of the wide variation of normal ^[5].

The assessment of the size & tension of the AF is important in routine examination of newborn ^[6,7]. The key feature of a normal AF is variation on the 1st day of an infant's life, the normal fontanel ranges from 0.6cm to 3.6cm, with mean of 2.1 cm ^[8]. Black infants have larger fontanels ^[1,4 - 4.7] ^[9]. The fontanel can enlarge in the 1st few months of life ^[10]. AF tends to close earlier in boys than in girls; the initial size of the fontanel is not predictor of when it will close ^[11].

An abnormal fontanel in an infant can indicate a serious medical condition. Therefore, it is important to understand the wide variation of normal, how to examine the fontanel, & which diagnosis to consider when an abnormality is found ^[12].

Patient & Method:

The sample of the study consisted of 200 normal, full term neonates.

100 males 100 females, selected by simple random sampling from infants attending the vaccination center in Central Teaching Hospital For Children in Baghdad, for the period between Jan. 1997- Jan.1998.

The sample met the following criteria:

- Gestational age between 38-40 weeks determined by maternal dates (last menstrual period) & confirmed by clinical assessment using Dubowitz method (13).
- The neonates born by normal vaginal delivery, following normal pregnancy.
- The followings were excluded from the study:
 - *High-risk pregnancy Cases.
 - *Abnormal presentation & labor.
 - *History of fetal loss or fetal malformation in previous pregnancies.
 - *Infant born by cesarean section & infants who are SGA.
- Neonates with congenital malformation, or with evidence of birth injury, asphyxia, cephalhematoma, & / or illness, were excluded from the study.

The birth weight, length, & head circumference of all babies were within 10th -90th centile of standard curves (14).

The AF size was measured after 72 hours of birth to allow resolution of molding, the age of infants ranged between 6-16 days.

The Method of Measurement

AF measurement was taken using methods devised by Davis (7) & Popitch (8).

The four apices of the AF were identified & the index finger was introduced in turn into each of the four centers, & a small dot with washable color pen

was marked on scalp immediately distal to the fingertip (Fig.1).

The length (anterior-posterior) & Width (transverse) diameter, thus marked were measured by tape measure for each baby. The measurements were recorded to the nearest 0.25 cm.

The fontanel size was recorded as average of measurements of anterior-posterior & transverse diameters of the fontanel along the lines of sagittal & coronal sutures. A piece of white paper was firmly pressed over the fontanel so that the four dots were transferred onto the paper. The points were joined by

straight line to form a quadrilateral shape (Fig.2) and the enclosed area was then calculated in the following stages:

1. Points A & C were joined by straight line AC that served as common baseline for triangles ABC & ADC.
2. A line (a-c) parallel to AC was then drawn through D.
3. A perpendicular line was dropped from the apex B of triangle ABC to intersect the line (a-c) at X.
4. AC & BX was then measured in milliliter & the area of the figure ABCD in mm² was obtained by the formula:

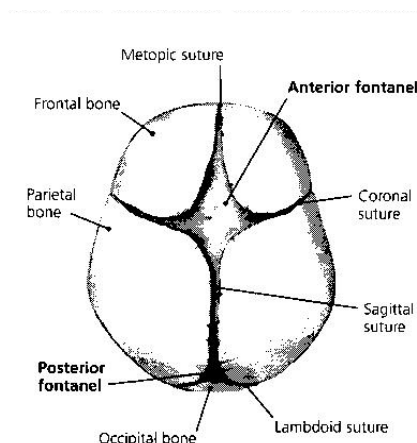


Figure 1: Measurement of the anterior fontanel..

$$\text{Area of ABC} = \frac{AC \times BX}{2}$$

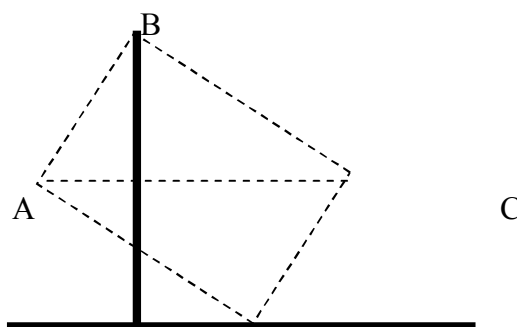


Figure 2: The method of calculation of the area of the anterior fontanel.

Data were presented in simple measurements of mean & standard deviation; with significance, testing for the differences in means between both sexes was done using Student *t*-test with the significance level of 0.05.

Result:

The gestational age of infants ranged from 38-40 weeks. The mean birth weight of boys was 3228 ± 475 (range 2500-4000) grams, while the mean birth weight of girls 3256 ± 530 (range 2300-4200) grams.

Table 1 showed that the mean birth weight of girls slightly higher than that of boys but difference was not significant ($P=0.539$).

The mean crown-heel length of boys was 49.67 ± 2.55 (range 43-56) cm, while mean crown-heel length of girls was 49.42 ± 2.02 (range 46-54) cm ($P=0.589$).

Table 2 shows no effect of length on AF size ($P=0.306$).

Table 1: The mean AF size in relation to the body weight.

Body weight (Kg)	No of sample	AF size (Mean \pm SD)
2.0-2.4	10	2.60 ± 0.14
2.5-2.9	50	2.90 ± 0.77
3.0-3.4	70	2.64 ± 0.69
3.5-3.9	56	2.81 ± 0.71
4.0-4.5	34	2.97 ± 0.71

* $P=0.539$ (Not significant).

Table 2: The mean AF size in relation to the length.

Length (cm)	No of sample	AF size (Mean \pm SD)
43.0-44.9	8	3.15 ± 0.81
45.0-46.9	18	2.57 ± 0.69
47.0-48.9	84	2.95 ± 0.75
49.0-50.9	50	2.66 ± 0.69
51.0-52.9	28	2.63 ± 0.47
53.0-54.9	12	2.60 ± 0.94

* $P=0.306$ (Not significant).

About the mean head circumference in boys, it was 34.25 ± 1.17 (range 32-37) cm, while

the mean head circumference in girls was 34.23 ± 1.25 (range 32- 36) cm ($P=0.932$) & in

relation to mean AF size the head circumference in our study showed no significant change or no significant effect on AF size ($P=0.539$) (Table 3).

Table 4 shows the numbers of female & male newborns & their mean AF size.

It was found that the mean AF size for boys was 2.99 ± 0.73 (range 1.6-4.7) cm while the

mean AF size for girls was 2.58 ± 0.65 (range 1.5-4.6) cm as shown in (Table 4).

Figure 3 shows that the mean AF size for boys was higher than that of girls & the difference was significant ($P=0.004$). The mean value for AF area was 176.26 ± 53.39 (range 50– 255) mm^2 in boys & 160.32 ± 46.78 (50-270) mm^2 in girls (the difference was not significant; $P=0.113$) with the total mean of AF area of both sexes was 168.32 ± 50.58 (Table 5).

Table 3: The mean AF size in relation to the head circumference.

Head circumference (cm)	No of sample	AF size (Mean \pm SD)
32.0-32.9	20	2.65 ± 0.48
33.0-33.9	40	2.77 ± 0.74
34.0-34.9	50	2.79 ± 0.71
35.0-35.9	60	2.84 ± 0.67
36.0-36.9	30	2.69 ± 0.84

* $P=0.539$ (Not significant).

Table 4: The AF size of the newborns by sex (males and females).

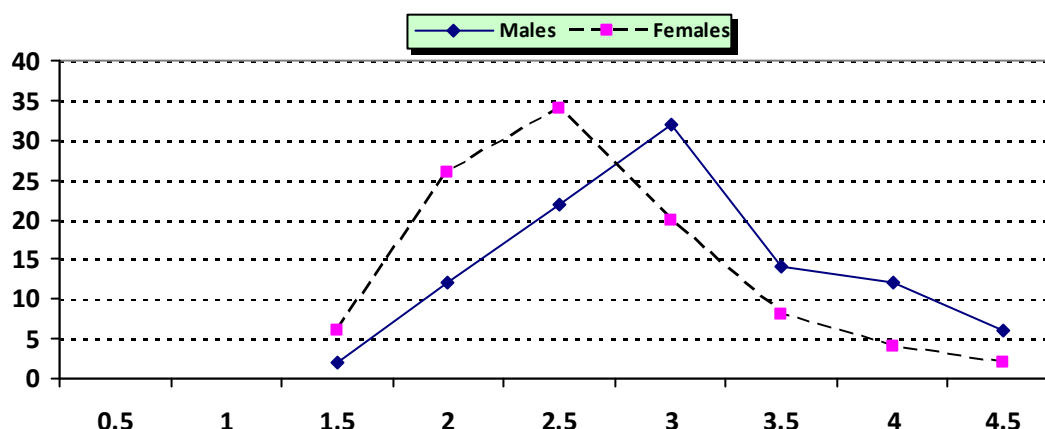
AF size (cm)	Males	Females
1.25-1.74	2	6
1.75-2.24	12	26
2.25-2.74	22	34
2.75-3.24	32	20
3.25-3.74	14	8
3.75-4.24	12	4
4.25-4.74	6	2
Mean \pm SD (Range)	2.99 ± 0.73 (1.6-4.7)	2.58 ± 0.65 (1.5-4.6)

Table 5: The mean AF size and AF area in the sample included in the study by sex (males and females).

	Males Mean±SD	Females Mean±SD	Total Mean±SD
AF size (cm)*	2.99±0.73	2.58±0.65	2.79±0.71
AF area (mm ²)**	176.26±53.39	160.30±46.79	168.32±50.58

*P=0.004 (Significant)

**P=0.113 (Not significant)

**Figure 3: The distribution of mean AF size in male and female newborn infants.****Discussion:**

This study showed the normal values for AF size for appropriately grown full term newborns with separate standards for AF size in boys & girls.

The mean AF size of our infants was greater than AF size of White American, Arab, Turkey, & South East Asian infants [6,9,15,16].

The difference in AF size could be explained by, we conducted our study after 72 hours of birth, while others studied their infants within one or two days of birth, resolution of cranial molding & overlapping sutures on fontanel size is more likely by the day three.

Toksoy & Tanzer reported that AF size in Turkey infants was greater in males than females & the difference between the two sexes was statistically not significant, in contrast to our study, which show the mean AF size in males was significantly greater than in females, the result is quite similar to AF size in Arab infants as reported by Mir NA & Weislaw that AF size is greater in males than females with significant difference, while boys tend to have a slightly larger occipito-frontal circumference at birth than females & in our study we found that

head circumference effect on AF size was not significant.

The mean value of AF area of our infants was lower than that of full term infants reported by Davies & lower than that of full term infants in Turkey (in Sivas).

Conclusion & Recommendation

It is concluded that AF size of Iraqi newborns included in the study is larger than AF size of American, Arab, Turkey & South East Asia infants and there is a need to study the AF size in preterm & small for date infants.

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