Ultrasonic Measurements of Fetal Biparietal Diameter in Normal Pregnant Northern Thai Women

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Abstract : *Fetal biparietal diameters (BPD) were measured by two perinatologists, who were well-trained for obstetric ultrasound, using Aloka models SSD 630 and 650. The measurements were performed on 1230 occasions in 452 women during normal pregnancies between 14 - 40 weeks (ages range 17-38 years), 205 of whom having had one examination while the remaining 247 had 1025 examinations. For each week of gestational age, the measurements were done at least on 35 occasions. The gestational ages were based on the history of the last menstrual period, first trimester antenatal care clinic, and consistent with Dubowitz scores in every case. The mean increase in BPD between 14 - 30 weeks, 31 - 36 weeks and 37 - 40 weeks were 3.1, 1.9 and 1.3 mm/week respectively. The values of BPD for each gestational week in this study are baseline data for evaluation of fetal BPD growth in the northern part of Thailand. (Thai J Obstet Gynaecol 1990; 2: 73-79.)*

Key words : biparietal diameter, gestational age, normal pregnant northern Thai women

Accurate assessment of gestational age is one of the most important roles in diagnostic ultrasound. Measurement of the crown-rump length in the first trimester[1,2] or fetal biparietal diameter in the second trimester[2-4] is a precise method of determining gestational age.

BPD could be determined by ultrasound from 14 weeks through pregnancy and serial measurements give information for evaluation of fetal growth.

Results of BPD measurements in other, mostly European and American population have been published by several workers[2-4]. Jordaan[5] reported that the BPD measurements at term for a given weight showed biological variation in different population, although Dobowitz and Goldberg[6] advocated that racial origin did not influence the BPD measurement.

It was demonstrated that birth-

weight of Thai newborns was less than those of western newborns[7,8], therefore, it may not be suitable to use standard BPD growth of western data to evaluate pregnant Thai women. Little comparable information has been published from developing countries especially southeast Asia. The study of BPD growth in the central part of Thailand, but not in the north, has been reported[9]. We, therefore, decided to measure the fetal BPD with ultrasound in pregnant northern Thai women to create a normal fetal BPD growth curve for our population.

Subjects and Methods

The study included 452 pregnant northern Thai women attending the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital. The subjects had to meet the following criteria : 1) history of regular menstruation and the exact date of the last menstrual period was known, 2) singleton pregnancy without medical or obstetrical complication, no evidence of intrauterine growth retardation and congenital anomalies, 3) attending antenatal clinic within first trimester of pregnancy and menstrual age consistent with clinical examination, 4) Dubowitz scores must be assessed and the scores confirm LMP (gestational age by Dubowitz scores must not be different from menstrual age by more than 2 weeks), 5) labour occured spontaneously within 2 weeks of predicted date of delivery.

The study was conducted between April 1989 and December 1990. The fetal BPD was measured on 1230 occasions in 452 pregnancies.

All scanning was done with Aloka models SSD 630 and SSD 650 scanner with a transducer frequency of 3.5 MHz. At each measurement, the midline echo of fetal skull, cavum septum pellucidum and thalamus were clearly visible on the scan display, and measurement of the BPD is made with electronic calipers (calibration based on a speed of sound in tissue of 1540 mm/second) from the outer margin of the proximal skull table to the inner margin of the distal skull table (leading edge to leading edge).

All examinations were performed by two of the authors (T.T, C.W.) who did not know the menstrual age of the patients. Dubowitz scores were assessed by only one pediatrician who had no information about the obstetric data of the patients.

Results

A total of 1230 measurements were obtained from 452 pregnant northern Thai women, 205 patients had one measurement each and 1025 measurements were obtained from the remaining 247 patients. The measurements were done from the gestational age of 14 weeks to 40 weeks, at least 35 measurements for each gestational week. The mean and 2 standard deviations (2SD) of BPD for each gestational week are shown in Table 1. The linear quadratic function was the best model for describing the relation be-

Table 1 Mean fetal BPD with 2 SD, 5th, 50th and 95th percentile for GA

GA week	No. of exam. (n)	Mean (cm)	2 SD (cm)	5th percentile	50th percentile	95th percentile
14	37	2.53	0.48	2.1	2.5	3.0
15	41	2.83	0.40	2.5	2.8	3.1
16	40	3.08	0.68	2.4	3.0	3.6
17	43	3.61	0.58	3.1	3.6	4.1
18	43	3.94	0.66	3.5	3.9	4.4
19	49	4.34	0.68	3.7	4.2	4.9
20	51	4.44	0.70	3.8	4.4	4.9
21	48	4.84	0.62	4.3	4.8	5.4
22	41	5.10	0.62	4.4	5.1	5.5
23	39	5.55	0.66	4.8	5.5	6.2
24	44	5.70	0.68	5.0	5.7	6.1
25	42	6.09	0.64	5.5	6.1	6.5
26	43	6.32	0.68	5.7	6.3	6.9
27	45	6.68	0.76	5.7	6.7	7.2
28	47	6.93	0.60	6.1	6.9	7.8
29	46	7.25	0.78	6.6	7.2	7.8
30	47	7.43	0.60	6.7	7.4	7.8
31	56	7.76	0.78	7.0	7.7	8.4
32	49	7.86	0.66	7.2	7.8	8.4
33	48	8.07	0.72	7.3	8.1	8.6
34	50	8.31	0.72	7.6	8.2	8.8
35	49	8.44	0.72	7.6	8.4	9.0
36	47	8.59	0.62	8.0	8.5	9.1
37	54	8.71	0.60	8.0	8.7	9.1
38	48	8.82	0.66	8.2	8.8	9.3
39	42	8.90	0.72	8.1	8.9	9.4
40	41	9.10	0.66	8.4	9.1	9.5

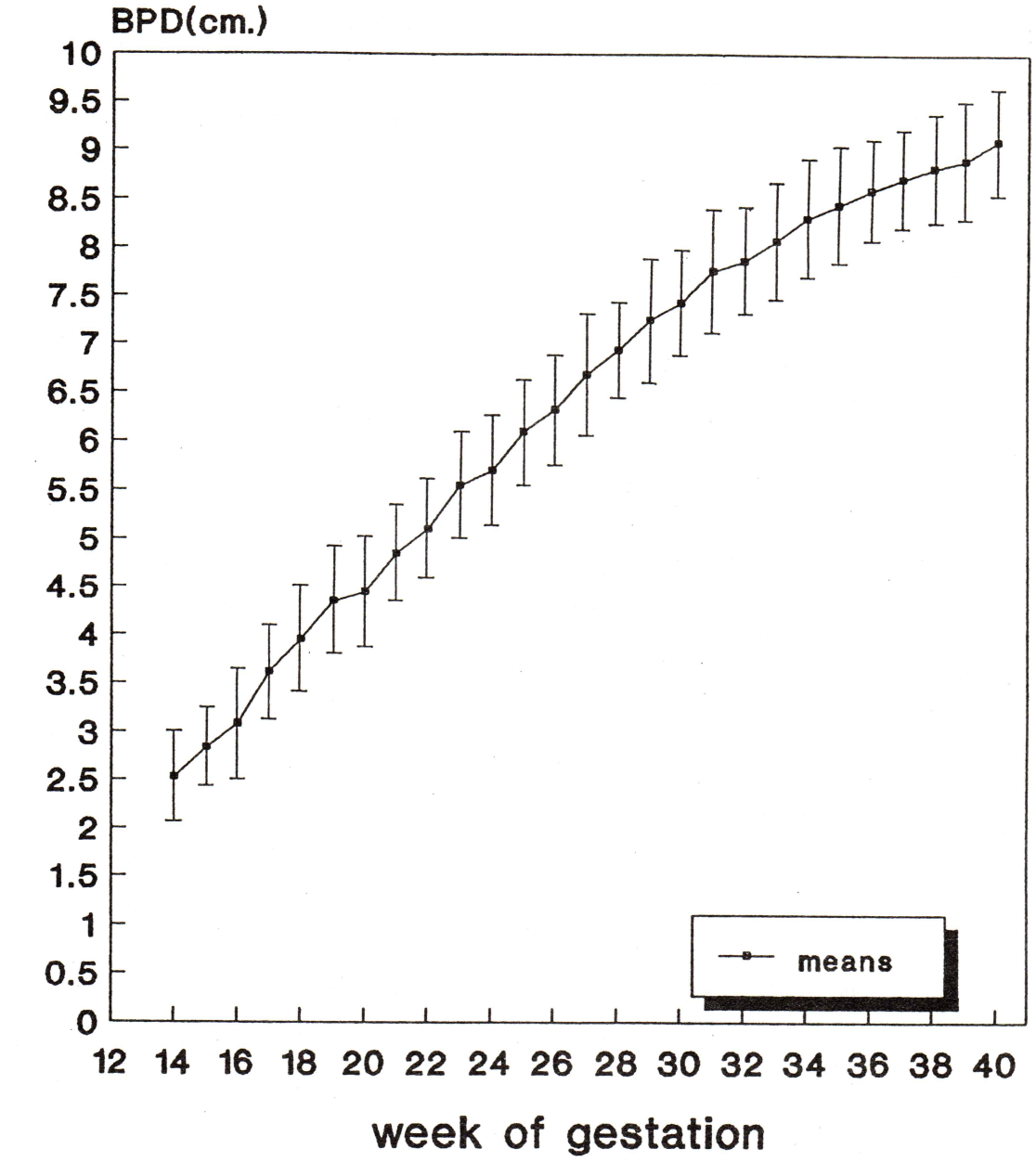

Fig. 1 Correlation between BPD and GA in normal pregnant northern Thai women.

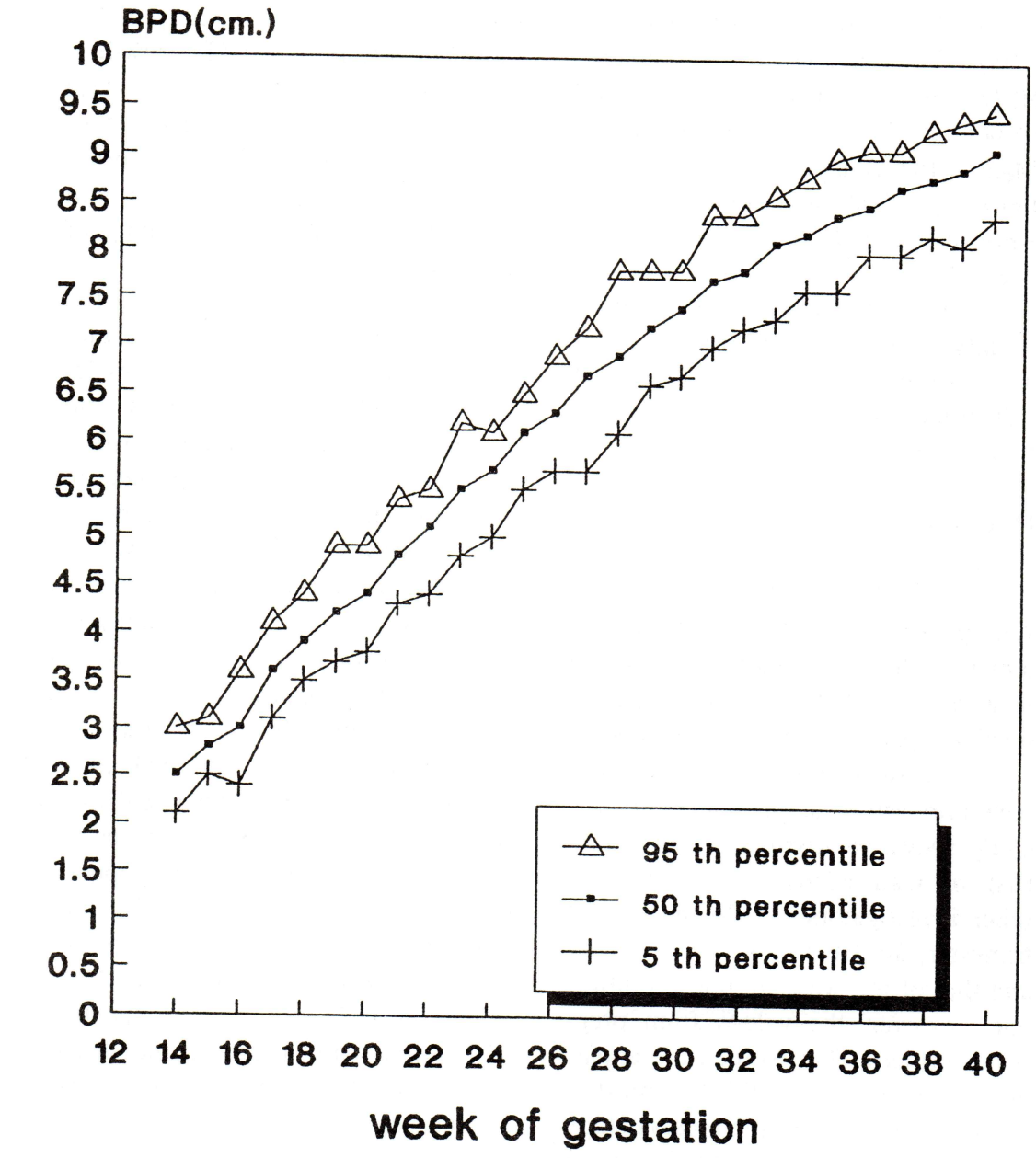

Fig. 2 Percentile chart of BPD in normal pregnant northern Thai women

tween BPD and gestational age (r = 0.98). The correlation was formulated, BPD = -4.25089 + 0.54998(GA) - 0.0 053847(GA2) [GA = gestational week]. Mean BPD values, 2 standard deviations, 5th, 50th and 95th percentile were calculated and are shown in Table 1.

From the tables, the means of weekly increase of BPD were 3.1, 1.9 and 1.3 mm/wk for 14 - 30 weeks, 31 - 36 weeks and 37 - 40 weeks respectively (Figs. 1,2).

Discussion

Two basic factors influence the fetal growth rate, intrinsic growth potential of the fetus which is genetically determined and the growth support it receives from mother and placenta.

Growth of fetal BPD in pregnant northern Thai population in this study shows an asymptotic curve like that of Caucasians as reported by other investigators[10-15]. In the second trimester, the BPD value of this study and that of the west are not too different, however, the values from pregnant northern Thai women are apparently lower in the third trimester. Comparison between the present study and another one at Chulalongkorn Hospital[9], mostly is not statistically significant different. Although our values are somewhat lower than those reported by western investigators, they, however, are consistent with those of the study in the central part of Thailand, the study at Chulalongkorn Hospital[9]. These findings suggest that the racial factor may be the important role in fetal BPD growth.

Our BPD growth curve does not show great variability of the standard deviation toward term, contrary to the western study[15], the growth curve of which shows a widening of the variability toward term.

Our results agree with the study of Jordaan[5] who found a biological variation in different populations for BPD measurements and emphasized the need for each institution to accumulate its own data to define the characteristics of the population it serves. Although our values were not so different from western studies during the second trimester, they were lower in our series than the others in late pregnancy[10-14].

The values from this study are important baseline data for evaluation of fetal BPD growth in our population and can be used as standard values of BPD growth of northern Thai population because they are created from various unselected socioeconomic status and adequate sample size. This growth curve is more appropriate for application with pregnant northern Thai women than the Caucacian standard curves[11-15].

Acknowledgements

The authors wish to thank the ultrasound unit staffs of the Radiology Department for their kind cooperation and valuable help. We also wish to thank Associate Professor Kamjad Swasdi-O and Associate Professor Suri Simarak for their encouragement.

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