ORIGINAL ARTICLE

Foetal Biometry in North Indian Population and its Comparison with Established Western Standards

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ABSTRACT

Background : Foetal biometry with the help of ultrasound scanning provides the most reliable and important information about the foetal growth and wellbeing. Foetal wellbeing is assessed on ultrasound using biometric parameters like biparietal diameter, femur length, abdominal circumference and head circumference to calculate the effective foetal weight. Amongst the available standards, no single ultrasound-based model is applicable to all populations. There is a significant discrepancy in the biometric parameters of Indian population when compared with the western standards. Many studies have highlighted differences in foetal growth patterns between Indian and other populations and have observed that Indian foetuses have lower birth weight and are smaller in all body measurements

Method : This prospective study was conducted to formulate targeted population based foetal biometric parameters and corresponding reference foetal growth charts, BPD, HC, FL and AC in all normal pregnancies from 14 weeks to term gestation were recorded after taking written and informed consent.

Patients with Maternal illness like diabetes mellitus, hypertension, severe anaemia, maternal cardiac illness, maternal infections, Pregnancy complications like PIH, oligohydramnios, polyhydramnios, IUGR, Multifetal gestation, Pregnancy with anomalous foetus, LMP not confirmed were not included in the formulation of charts. The values thus obtained were compared and analysed.

Results : The foetuses in north India are falling short of the western standards especially in the later trimester. The difference is slightly more marked for AC than other parameters. This might be due to nutritional factors, socio-economic factors, environmental factors, racial and genetic factors. This can lead to erroneous diagnosis of conditions like IUGR, microcephaly. We propose cut off value for diagnosis of microcephaly in north Indian population.

INTRODUCTION :

Foetal biometry with the help of ultrasound scanning provides the most reliable and importantin formation about the foetal growth and wellbeing. A wealth of important and relevant factorsis gathered covering the foetalanatomy, physiology and fatal behaviour.

Foetal wellbeing is assessed on ultrasound using biometric parameters like biparietal diameter (BPD), femur length (FL), abdominal circumference (AC) and head circumference (HC) to calculate the

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effective foetal weight. Doppler parameters are added for assessing the in-utero environment.

Existing ultrasound-based foetal weight estimation models have been shown to have high errors when used in the Indian population[1]. There is a significant discrepancy in the biometric parameters of Indian population when compared with the western standards.

Amongst the available standards, no single ultrasound-based model is applicable to all populations[2]. This discrepancy might be the result of genetic, socio-economic, nutritional and racial variations[3-7]. Available literature from different populations points to the need of a targeted population based biometric parameters for the most reliable estimation of foetal wellbeing.

Use of existing standards in Indian population has proved to have a high rate of error leading to an erroneously high estimation of foetal intrauterine growth restriction[8]. Many studies have highlighted differences in foetal growth patterns between Indian and other populations and have observed that Indian foetuses have lower birth weight and are smaller in all body measurements[4,9]. Thus, if practitioners incorporate existing standards in formulating foetal growth charts, overestimation of incidence of IUGR and microcephaly is likely.

Recent outbreak of Zika virus in Jaipur, Rajasthan led to need of accurate diagnosis of microcephaly. Established western standards of microcephaly may lead to overdiagnosis of microcephaly in this population.

METHOD

This prospective study was conducted to formulate targeted population based foetal biometric parameters and corresponding reference foetal growth charts.

BPD, HC, FL and AC in all normalpregnancies from 14 weeks to term gestation were recorded after taking written and informed consent.

Patients with Maternal illness like diabetes mellitus, hypertension, severe anaemia, maternal cardiacillness, maternal infections, Pregnancy complications like PIH, oligohydramnios, polyhydramnios, IUGR, Multifetal gestation, Pregnancy with anomalous foetus, LMP not confirmed were not included in the formulation of charts.

Data collection was done after approval from the ethical committee of the institute.

Routine ultrasound scan was done for all patients fulfilling the inclusion criteria.

BPD, HC, FC, AC was calculated using established guideline for proper measurement:

BPD : Maximum distance between the two parietal bones taken from the leading edge of the skull to the leading edge i.e. outer to inner at the level of the cavum septum pellucidum[10-12].

HC : Same level at which the BPD, taken by using the ellipsoid mode of the machine and adjusting the elliptical callipers to the outer margin of the skull table[13, 14].

AC : At the level where the umbilical vein enters the left branch of portal vein; alternatively, a scan at a slightly lower level showing a short segment of the umbilical vein may be taken[14, 15].

The outline of the abdomen should be as circular as possible.

FL : Diaphysis from the greater trochanter above to the lateral condyle below[15-17].

LMP was recorded for each patient. Data thus collected was compared to established Western standards for each gestational week.

Thereafter, 5th, 50th, 95th centileswere formulated for the targeted population.

Results

Foetal Biometric parameter from 2433 pregnant females meeting the inclusion criteria were collected and expressed as centiles for each week of gestation for each of the studied foetal parameters and analysed.

The values thus obtained were compared to the existing western standards.

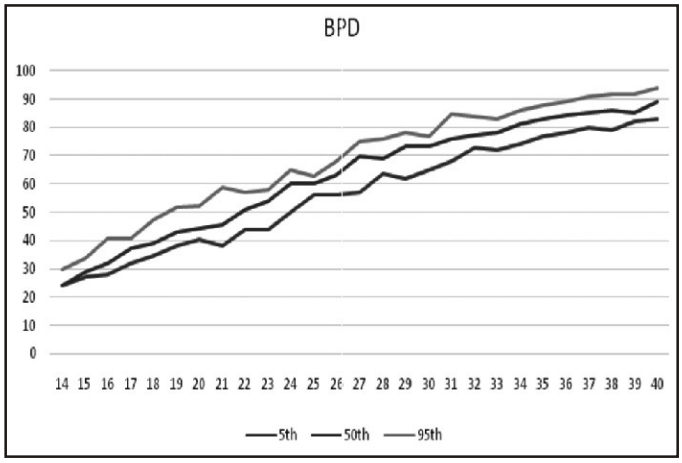

Figure 1 : Graph showing obtained centile values of Bipareital Diameter

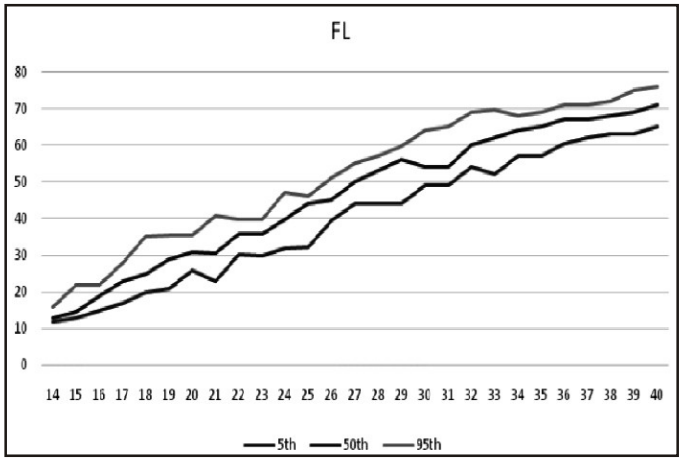

Figure 2 : Graph showing obtained centile values of Femur Leangth

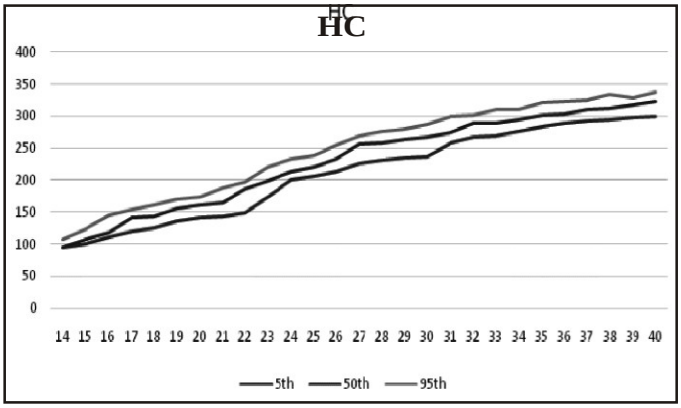

Figure 3 : Graph showing obtained centile values of Head Circumference

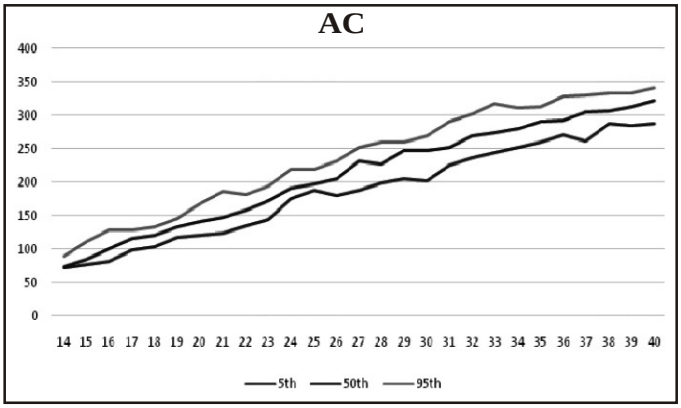

Figure 4 : Graph showing obtained centile values of Abdominal Circumference

These charts show the 5th, 50th, and 95th centiles in North Indian populationfor each of the foetal biometric parameters. (Fig-1-4)

The 50th percentile thus obtained in the North Indian population by us were then compared with the existing western standards(Hadlock reference values). (Fig 5-8)

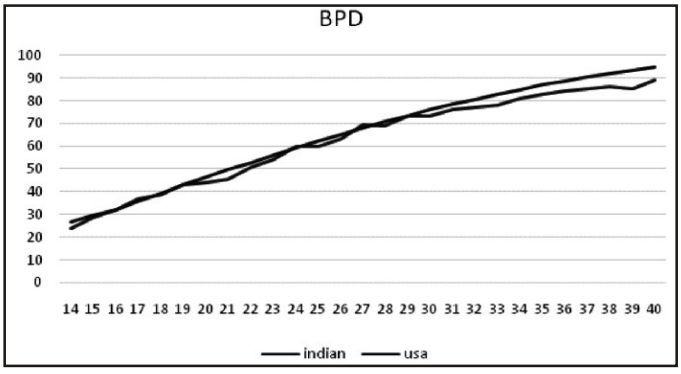

Figure 5 : Comparison of 50th centile of Indian and Western standards of Bipareital Diameter

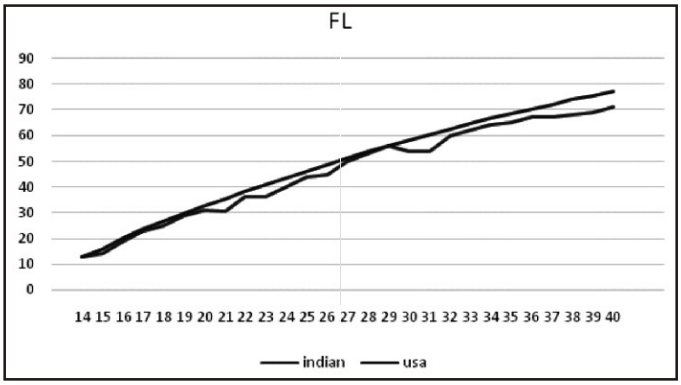

Figure 6 : Comparison of 50th centile of Indian and Western standards of Femur Leangth

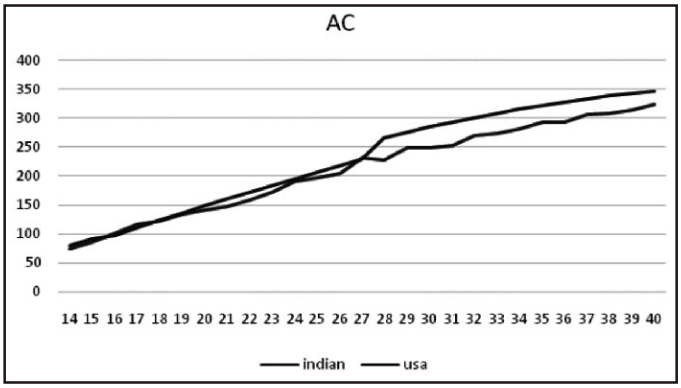

Figure 7 : Comparison of 50th centile of Indian and Western standards of Abdominal Circumference

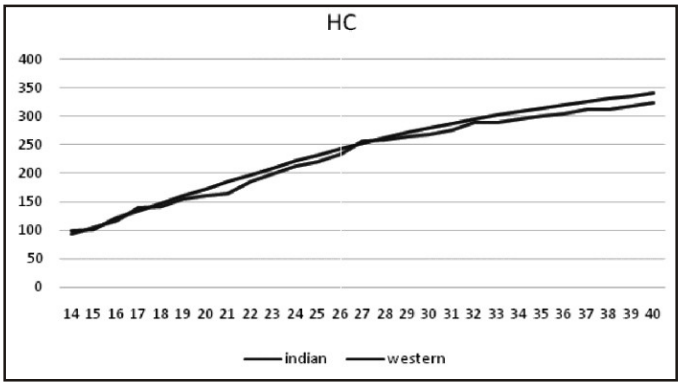

Figure 8 : Comparison of 50th centile of Indian and Western standards of Head Circumference

The foetuses in north India as is evident on the graphs are falling short of the western standards especially in the later trimester. The difference is slightly more marked for AC than other parameters. This might be due to nutritional factors, socio-economic factors, environmental factors, racial and genetic factors. Blanket parameters established for western population may not cater to all populations.

Also, in view of the recent outbreak of Zika virus, it had become important to correctly diagnose microcephaly. Therefore, we propose <3rd percentile of these HC values as a lower limit for diagnosis of microcephaly in our north Indian population. (Fig 9 & Table 1)

Table 1 : Centile values of head circumferences

Weeks	3rd	5th	50th	95th	97th
14	94	94	94	107	107
15	95.8	99	106	123	125.4
16	110	110	117	145	145
17	119	119	140	153.6	163.79
18	121	125.55	142.5	162	162
19	132.69	135	156	170	173.08
20	140.5	141.5	161	174.5	175.9
21	143	143	165	189	189
22	145	148.4	186	197	198
23	167	173	199	221	221
24	201	201	213	233	233
25	205	206	219.5	239	239
26	212	213.6	233.5	254.3	262.87
27	219.3	225.1	255.4	268.7	270.24
28	230.9	232	258	276	280.5
29	231.55	235	263.5	280.5	289.23
30	234.79	236	268	287.5	290
31	235	258.8	275	301	306
32	262.2	268	288	302	303.4
33	270	270	289	311	311
34	272	276	295	311.4	315.34
35	279	283	301	322	323.5
36	289	289	303	323	324
37	291	292	311	326	327.8
38	295	295	312	335	338.1
39	297	298	317	328.9	331.54
40	300	300	323	338	343.22

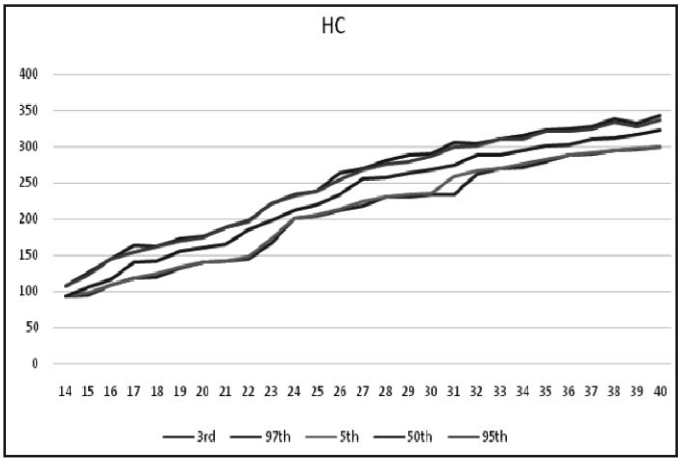

Figure 9 : Graph showing obtained centile values of Head Circumference

CONCLUSION:

The Indian parameters fall slightly short especially in the later weeks of gestation. This may be due to a multitude of factors including socio-economic status, nutrition, higher order births and genetic causes.

This can lead to erroneous diagnosis of IUGR and conditions like microcephaly. We propose cut off value for diagnosis of microcephaly in north Indian population.

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