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ORIGINAL ARTICLE

RELATIONSHIP OF ANTHROPOMETRIC PARAMETERS OF NEWBORN WITH VARYING PERIOD OF GESTATIONAL AGE

Narendra K. S[1], Madhu G. N[2], Adarsha E[3]

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ABSTRACT: BACKGROUND AND OBJECTIVE: The study of anthropometric measurements at birth allows construction of intra uterine growth curves and rapid evaluation of the infant who has suffered abnormal intrauterine growth and is at increased risk of postnatal metabolic complications. Present study was performed with objective to find correlation between anthropometric measurements and gestational age, and to construct normograms for all the anthropometric measurements studied. This provides base line data for indigenous population and can be gainfully employed for further studies to know whether simple anthropometric measurements other than birth weight will be useful to quantitate fetal growth and to identify at risk babies in rural community level where there is a paucity of weighing scales. **METHODOLGY:** Study was conducted on 1284 consecutive live births delivered at Kempegowda institute of medical college and research center. The gestational age of infants was calculated from the first day of LMP, and confirmed by clinical assessment using New Ballard Score. Newborns were subjected to anthropometric measurements within 48 hours of birth by standard techniques. The data obtained was subjected to a computer-based analysis to derive mean, standard deviation and normograms. **RESULTS AND CONCLUSION:** The derived normograms shows there is a linear relationship between all the anthropometric measurements studied with gestational age. There is increase in all the anthropometric parameters with increasing gestational age up to 39-40 weeks, after which it started declining. All the anthropometric parameters measured were correlated well to gestational age ($p<0.0001$). Maximum correlation was found with chest circumference (0.763). Further studies are required to know whether this simple anthropometric measurement can be used to quantitate fetal growth and to identify babies of abnormal fetal growth at rural community level.

KEYWORDS: Anthropometry, Gestational age, Intra uterine growth curves, Chest circumference.

INTRODUCTION: Babies with abnormal fetal growth need to be identified and observed closely as they have a higher neonatal mortality and morbidity, as compared to normally grown babies of identical gestation. These babies with abnormal fetal growth are more prone for metabolic derangements like hypoglycemia and polycythemia during neonatal period.[1] Therefore it is very essential to recognize neonates with abnormal fetal growth at birth, so that it forewarns pediatrician for subsequent management of complications on priority basis. To identify these babies at risk we have to quantitate normal fetal growth in utero and to classify newborn baby into SGA, AGA, and LGA. For which construction of intra uterine growth curves are very essential.

Birth weight has been universally used as a measure of intrauterine growth largely because of relative ease of its measurement in hospital setting and of its correlation with gestation. However birth weight by itself is not infallible. Infants of identical race, sex, gestational age and length have been known to differ in their body weights by up to 40%. Also birth weight is the sum of fat and lean

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body tissue. Weight gain represents the sum of increments of different body components including muscle, skeleton, adipose tissue and water. So it is rather a nonspecific measure of growth.[2] Further, in our country maximum births occur at home, where there is a paucity of weighing scales.

So alternative simple anthropometric measurements could be useful for assessing fetal growth. Studies from other workers also established the strong correlation of MAC as well thigh circumference with gestational age and early neonatal mortality.[3-7]

However such use is hampered by absence of normative data. Present study was performed with objective to find correlation between anthropometric measurements and gestational age, and to construct normograms for all the anthropometric measurements studied.

This provides base line data for indigenous population and can be gainfully employed for further studies to know whether simple anthropometric measurements other than birth weight will be useful to quantitate fetal growth and to identify at risk babies in rural community level.

MATERIAL AND METHOD:

Settings: Kempegowda institute of medical college and research center.

Duration: 1 year.

Inclusion Criteria: All the singleton live born babies born in hospital were included in the study.

Exclusion Criteria:

A. All multiple born babies.
B. Babies with gross congenital anomalies.
C. Babies born to mothers with condition likely to influence fetal growth i.e. hypertensive disorders of pregnancy, gestational diabetes mellitus, chronic infections and illnesses are excluded.
D. Babies whose gestational age could not be accurately assessed i.e. >2 weeks difference between obstetrical and clinically assessed gestational age.

METHODOLOGY: Study was conducted on 1284 consecutive live births delivered at Kempegowda institute of medical college and research center. Infants with gross congenital anomalies, infants of diabetic mothers, toxemic mothers and infants whose gestational age could not be accurately assessed were not included in the study.

The gestational age of infants was calculated from the first day of LMP, and confirmed by clinical assessment using New Ballard Score. Newborns were subjected to the following anthropometric measurements within 48 hours of birth by standard techniques: Birth weight, Crown heel length, Head circumference, Chest circumference, Abdominal circumference, Thigh circumference, Calf circumference, Mid arm circumference, Skin fold thickness and Foot length. The data obtained was subjected to a computer-based analysis to derive mean, standard deviation, 10th, 50th, 90th percentile values and normograms.

STATISTICAL METHOD USED: A pre-tested proforma was used to collect data. Single exponential Smoothing technique has been used to smooth the data obtained to derive intrauterine growth curves.

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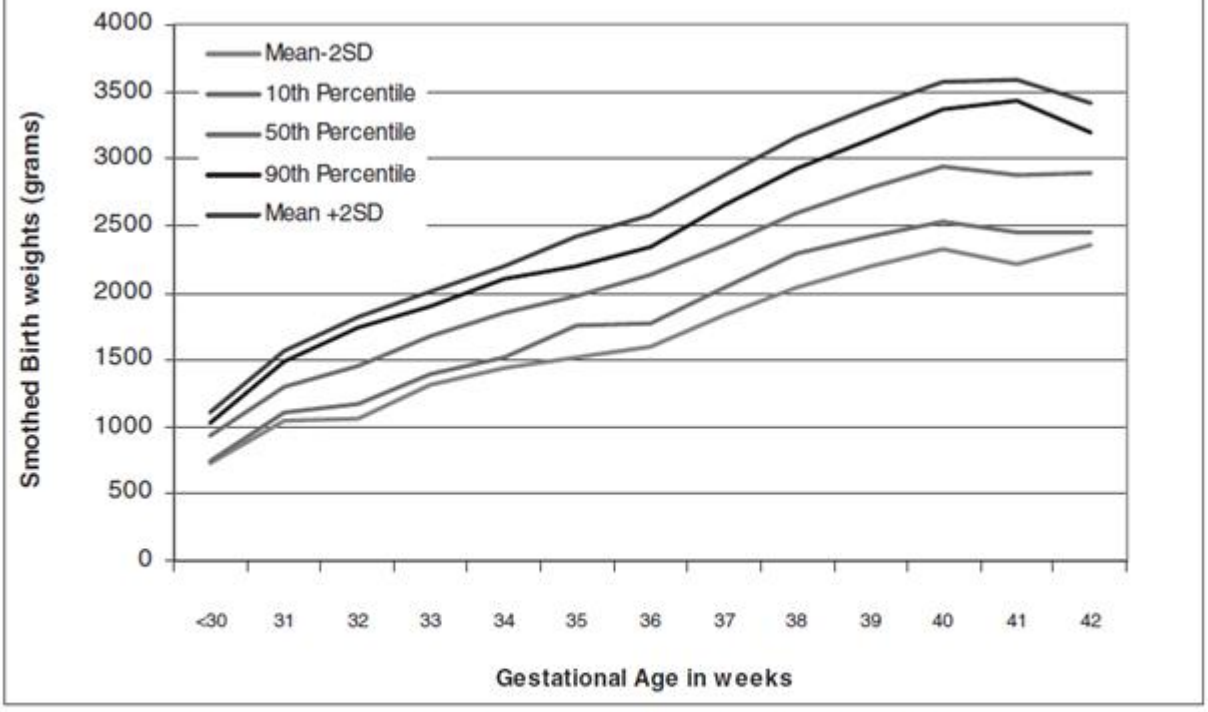
OBSERVATIONS AND RESULTS: 1284 single live born babies were included in the study. As there were only 6 babies between 28-30 weeks of gestational age they were categorized as <30 wks. The normograms are presented as 10th, 50th, 90th percentiles with ± 2 SD for ten anthropometric measurements study.

These derived normograms shows there is a linear relationship between all the anthropometric measurements studied with gestational age. There is increase in all the anthropometric parameters with increasing gestational age up to 39-40 weeks, after which it started declining. All the anthropometric parameters measured were correlated well to gestational age ($p<0.0001$). Maximum correlation was found with chest circumference (0.763). The mean and SD of all the anthropometric measurements studied were comparable with other Indian studies but were lower than western studies.



Graph 6. showing the normogram of birth weight with 10th, 50th, 90th percentiles and mean ± 2SD.

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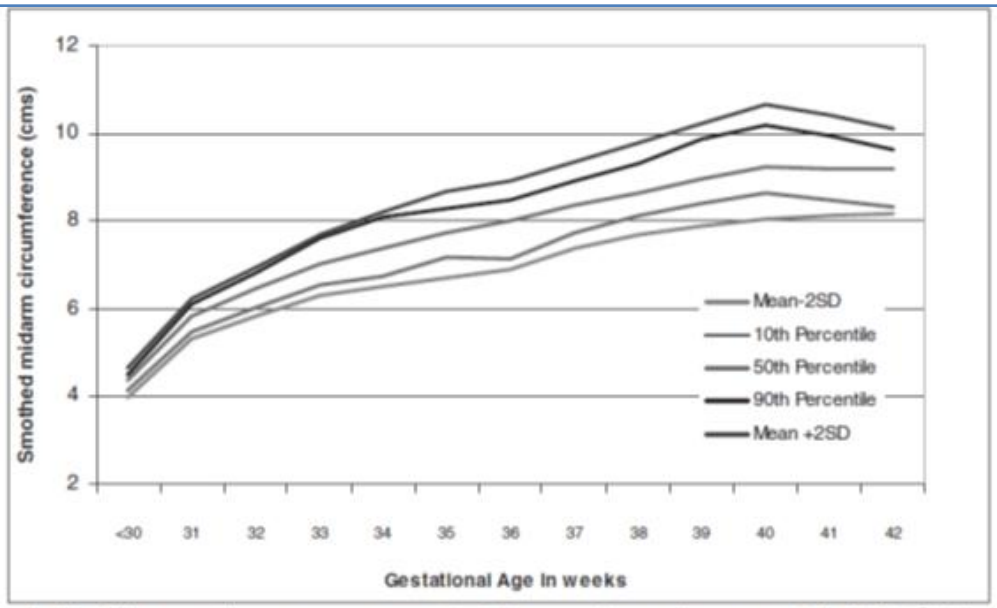
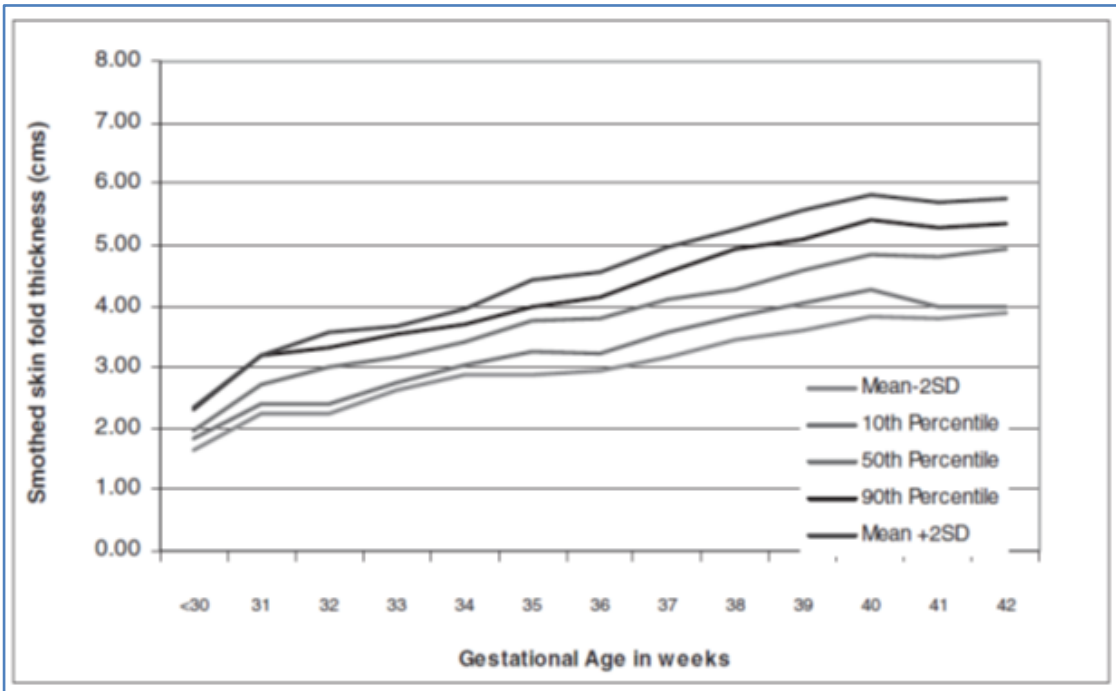


Graph 11. Shows the normogram of mid arm circumference with 10th, 50th, 90th percentiles and mean ± 2SD.



Graph 13. Shows the normogram of skin fold thickness with 10th, 50th, 90th percentiles and mean ± 2SD.

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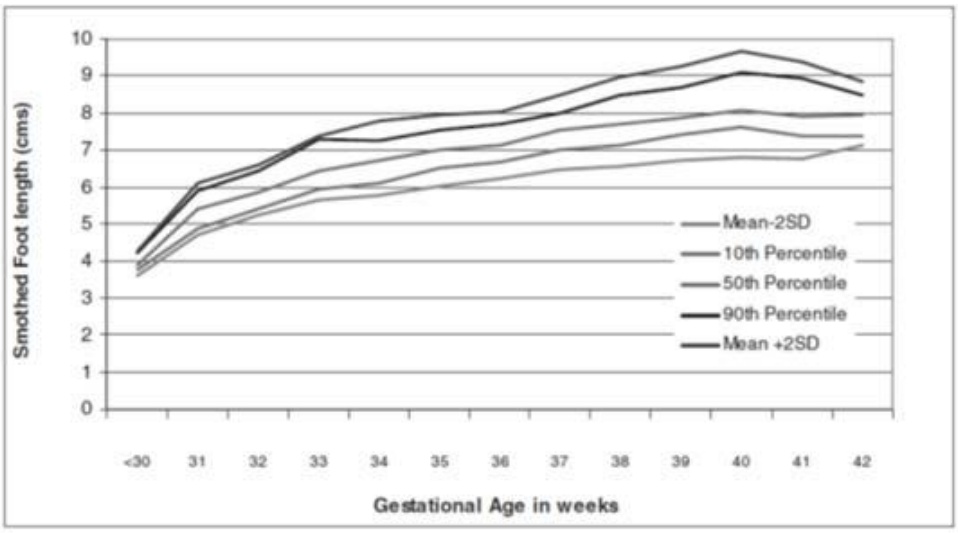

Graph 14. Shows the normogram of foot length with 10th, 50th, 90th percentiles and mean ± 2SD.

Table 15: Correlations between Gestational age and anthropometric parameters

Anthropometric parameters	Correlation	P-value
Birth weight	0.710	<0.0001
Crown heel length	0.726	<0.0001
Head circumference	0.687	<0.0001
Chest circumference	0.763	<0.0001
Abdominal circumference	0.751	<0.0001
Mid arm circumference	0.664	<0.0001
Calf circumference	0.654	<0.0001
Skin fold thickness	0.646	<0.0001
Foot length	0.523	<0.0001
Mid thigh circumference	0.727	<0.0001

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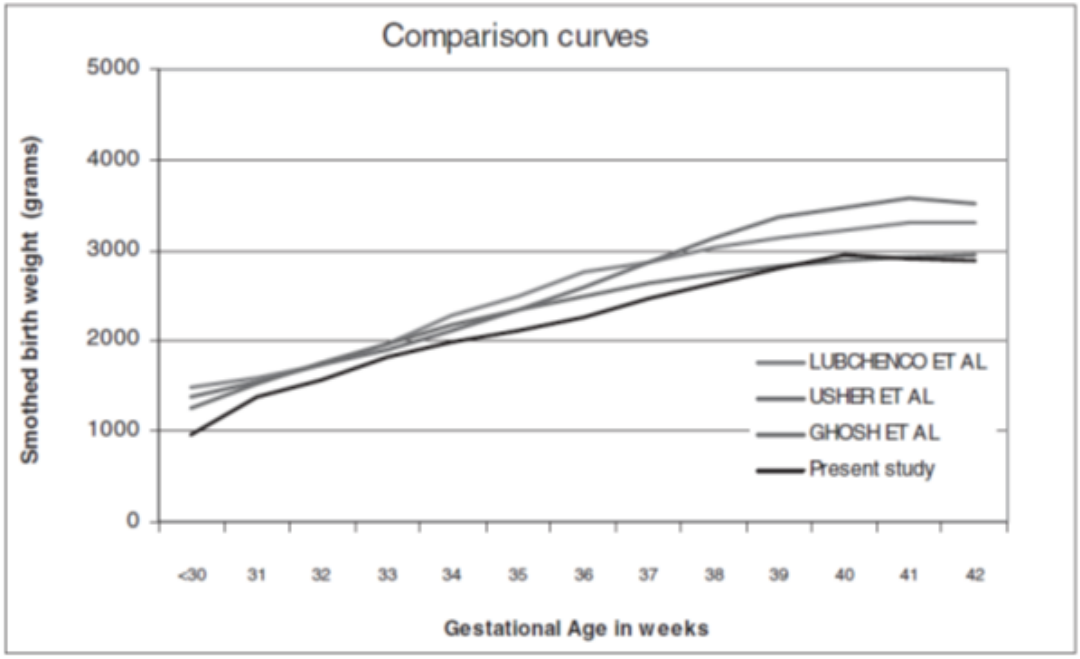

Graph 16. Comparison of Intrauterine weight curves

DISCUSSION AND CONCLUSION: Construction of fetal growth curve is essential for recognition of babies with abnormal fetal growth at birth. Early identification of these at risk neonates helps for early referral in a rural setting.

As there is wide variation in the pattern of the intrauterine growth of babies in the developing and developed countries, it is necessary for all countries to develop their own standard to avoid over and under estimation of SGA babies.

These normograms can be gainfully employed for further studies to know whether simple anthropometric measurements other than birth weight will be useful to quantitate fetal growth.

The derived intrauterine weight curve in our study is comparable with other Indian studies but was below the growth curves of the western studies.[8, 9, 10]

All the anthropometric parameters studied show a linear relationship with increasing gestational age.

All the anthropometric parameters correlated well with gestational age ($p<0.00.1$)

Maximum co-efficient of correlation was found with chest circumference (0.763).

WHO also recommended that in areas where the early weighing of neonate is not feasible, community health workers should be trained to measure the chest circumference to find out “at risk” neonate.[11]

Further studies are required to know whether this simple anthropometric measurement can be used to quantitate fetal growth and to identify babies of abnormal fetal growth at rural community level.

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AUTHORS:

1. Narendra K. S.
2. Madhu G. N.
3. Adarsha E.

PARTICULARS OF CONTRIBUTORS:

1. Junior Resident, Department of Paediatrics, Kempegowda Institute of Medical Sciences and Research Centre, Bangalore.
2. Junior Resident, Department of Paediatrics, Kempegowda Institute of Medical Sciences and Research Centre, Bangalore.
3. Associate Professor, Department of Paediatrics, Kempegowda Institute of Medical Sciences and Research Centre, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Narendra K. S,
S/o, Late Siddashetty K,
#1486, Taluk Office Road,
K. R. Pet- 571426, Mandya District,
Karnataka, India.
Email: narendraks@yahoo.com

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