A study on the correlation between the abdominal circumference of neonates and gestational age

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Abstract

Normal fetal growth is characterized by cellular hyperplasia followed by hyperplasia and hypertrophy and lastly by hypertrophy alone. Most fetuses follow a very similar growth curve during the first half of pregnancy and any slowing of growth usually occurs in the second half. Fetal growth does not occur at a uniform rate but rather changes over gestation. The rate of growth in the normal fetus various with gestational age, with an increasing exponential curve, in the 1s trimester. A linear curve in the 2nd trimester and most of the trimester and a decreasing exponential curve after 37weeks of gestation.1

INTRODUCTION

Normal fetal growth is characterized by cellular hyperplasia followed by hyperplasia and hypertrophy and lastly by hypertrophy alone. Most fetuses follow a very similar growth curve during the first half of pregnancy and any slowing of growth usually occurs in the second half. Fetal growth does not occur at a uniform rate but rather changes over gestation. The rate of growth in the normal fetus various with gestational age, with an increasing exponential curve, in the 1s trimester. A linear curve in the 2nd trimester and most of the trimester and a decreasing exponential curve after 37weeks of gestation.1

During first trimester of pregnancy growth is characterized by differentiation of various organs. Organogenesis completes by 10 -20 weeks of gestation.

During second trimester of pregnancy increase in the length of the fetus is proportionately greater as compared to increase in weight. By the end of 28 weeks fetal weight is about 1000 g and crown heel length is 35 cm.

During last trimester there is rapid increase in the weight and size of the fetus imposing considerable nutritional demands on the mother. After reaching the maximum weight gain deceleration occurs as a result it is believed of declining growth support from the intrauterine environment especially that coming from the placenta. At 40 wks, an average Indian baby weighs 2800g and has crown heel length of 48cm and head circumference of 34cms but there are differences between populations. Boys grow faster than girls. Though differences are marginal and intrauterine growth curves of infants of both sexes are satisfactory for clinical purposes.2

One of the most striking changes taking place during fetal life is the relative slow down in growth of the head compared with the rest of the body. At the beginning of the third month the head constitute approximately half of the CRL. By the beginning of the fifth month, the size of the head is about one third of the CHL, and at birth it is approximately one–fourth of the CHL. Hence over time of the body accelerates but that of the head slows down. 3

Normal fetal growth varies almost two fold, for mean birth weight for neonate born in New Guinea is 2400 g where as normal birth weight in other populations can exceed 4000

g. Such variations are related to genetic and environmental factors, the latter usually reflecting local diets etc. These and other normal anthropometric variations must be considered in relation to the diagnosis of intrauterine growth restriction.4

Genetic and environmental influences may affect an embryo and fetus at any time during development, the fetal genome itself has a significant role in development and fetal survival. Different patterns of intrauterine weight gain are probably primarily caused by environmental factors, which some how affect the immediate intrauterine environment of the fetus.5,6

METHODOLOGY

1283 single live babies born in institute of medical college and research center over a period of one year were included in the study.

INCLUSION CRITERIA:

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

EXCLUTION CRITERIA:

1) All twin babies.

2) Intra uterine deaths and still born babies.

3) Babies with gross congenital anomalies.

4) 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.

5) Babies whose gestational age could not be accurately assessed i.e. >2 weeks difference between obstetrical and clinically assessed gestational age.

METHOD OF COLLECTION OF DATA:

All the singleton live born babies born in the hospital were examined with in 48 hours of birth. Gestational age was calculated by enquiring into 1st day of mothers last menstrual period and will be subsequently confirmed by New Ballard Score. If any disparity of more than 2 weeks between gestational age by enquiring LMP and by NBS, were excluded from the study. Their gestational ages ranged from 29 to 42 weeks. As there were few babies in less than 30 weeks gestation they were grouped together.

Newborns were subjected to the following anthropometric measurements within 48 hours of birth by standard techniques.

Abdominal circumference: Abdominal circumference is measured at the level of the umbilicus with a fiber glass tape to the nearest of 0.1cm.

RESULTS:

The mean abdominal circumference of the babies analyzed was 27.42 cm, with the

standard deviation of 2.14 cm.

It was found that abdominal circumference was correlated well with the gestational age.

($r = 0.751$, $p < 0.0001$)

There is a increasing of the abdominal circumference with the increasing gestational age, which started declining after 39-40 weeks gestation.

There is slight depression in the curve noticed especially in 36 wk of gestational age.

This depression is possibly because of small numbers of study group in this gestational age leading to deviation.

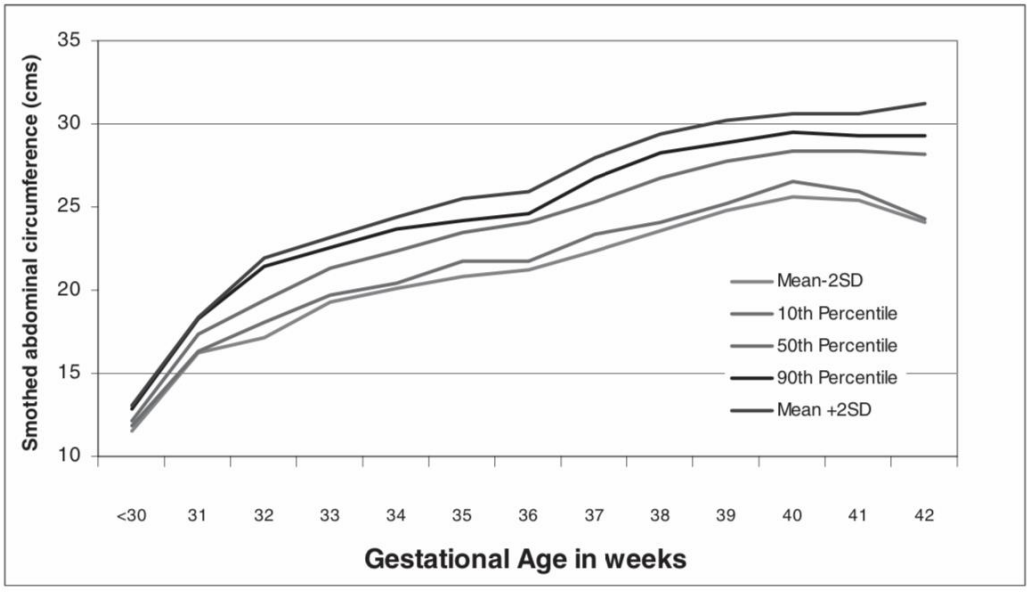

Fig 1: Abdominal circumference and Gestational age

Table 1: ABDOMINAL CIRCUMFERENCE

Gestational age (wks)	No. of subjects	Mean	Std. Deviation	Mean-2SD	Percentiles			Mean + SD
					10th	50th	90th	
<"30	6	19.77	0.65	18.47	19	19.6	20.8	21.07
31	8	20.68	0.66	19.36	19.4	20.8	21.8	21.99
32	7	20.97	1.63	17.70	19.2	20.8	23.6	24.24
33	12	22.38	0.79	20.80	20.8	22.6	23.28	23.95
34	30	22.97	1.14	20.68	20.81	23	24.38	25.26
35	21	23.74	1.28	21.19	22.68	24.3	24.56	26.29
36	46	23.85	1.16	21.52	21.78	24.4	24.8	26.17
37	124	26.23	1.58	23.08	24.4	26.2	28.2	29.38
38	235	27.41	1.48	24.45	24.6	27.6	29.2	30.37
39	315	28.13	1.28	25.56	26	28.4	29.4	30.69
40	437	28.55	1.20	26.14	27.4	28.8	29.8	30.95
41	36	27.98	1.34	25.30	25.52	28.4	29.2	30.65
42	7	27.40	2.10	23.20	23.2	28	29.2	31.60
Overall	1284	27.42	2.14	23.14	24.4	28.2	29.4	31.71

DISCUSSION:

AbC is measured at the level of the umbilicus with a fiber glass tape to the nearest of 0.1cm. This is the same method used in this study. Very few studies have been done to indicate relevance of AbC in identifying LBW babies.

Most studies show that AbC has a linear correlation with birth weight and gestational age. AbC is useful to identify, mainly Intrauterine growth retarded babies. A recently published report established interesting data on AbC at birth. Small AbC was associated with raised serum concentration of LDL cholesterol in adult life.7

There are some limitations in measurement of AbC in neonates. The state of feed of the baby may cause errors in measurement. If the baby is post feed, the AbC might vary due to asymmetry. Similarly, if the baby is crying, the girth might vary due to the tightness of the abdomen wall muscles or a big stomach bubble due to aerophagy. Minimal amounts of ascitis, which may not be detected clinically, can also cause error in measurement. Measurement of AbC needs undressing of the baby, which is again discomforting to the baby.8

CONCLUSION

There is a increasing of the abdominal circumference with the increasing gestational age, which started declining after 39-40 weeks gestation.

There is slight depression in the curve noticed especially in 36 wk of gestational age.

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