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Original Research Article

Correlation of Crown-Rump Length between 6 Weeks to 13 Weeks + 6 Days and Birth Weight at Term

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Conflict of interest: Nil

Abstract:

Introduction: Crown – Rump Length (CRL) is the measurement of the length of Human embryos and fetuses from the top of the head (Crown) to the bottom of the buttocks (Rump). This Formula is an approximation Gestational age (weeks of pregnancy) = Crown -Rump Length (cm) + 6.51 Low birth weight (LBW) infants are at increased risk of perinatal and infant death.2 LBW newborns have also been identified as a high risk group for a number of health Problems later in life.

Methodology: This is a prospective observational study done on patients coming to the Department of OBG Kempegowda Institute of Medical Sciences, Bangalore. All antenatal mothers will be advised to undergo first trimester ultrasound between 6 and 13+6 weeks of gestation. Correlation between CRL and Birth weight at term will be analyzed for the participants that meet the criteria.

Results: In our study among 150 patients 43% were primigravida and 57% were multigravida with the majority of them between 21-25 years of age. In this study 66.67% infants were low birth weight whereas 8.66% were more than expected birth weight. In our study correlation between CRL in first trimester and birth weight at term is not statistically significant. Hence we concluded that in our study there is no significant correlation between CRL and birth weight.

Conclusion: Newborn who is found to have low birth weight at delivery doesn't appear to have anomalous crown rump length growth patterns in the first trimester. The EFGR didn't correlate with birth weight percentile.

Keywords: Crown-rump length, birth weight, gestational age.

Introduction

Crown – Rump Length (CRL) is the measurement of the length of Human embryos and fetuses from the top of the head (Crown) to the bottom of the Buttocks (Rump).

Typical measurements:

Table 1: Gestational age for crown-rump length

Gestational age (in weeks)	Crown rump length (in cm)
6	0.35
7.1	1
8	1.6
9.1	2.4
9.4	2.6
10.6	3.7
12	5.4
13.2	6.9
13.6	7.8

Data from Nyberg, 1992; Hadlock 1992; Robinson; 1975; Daya,1991 This Formula is an approximation Gestational age (weeks of pregnancy) = Crown -Rump Length (cm) + 6.51 Crown rump length can be measured

out trans-abdominally or trans-vaginally a midline sagittal section of the whole embryo or fetus should be taken with a embryo or fetus oriented horizontally on the screen.

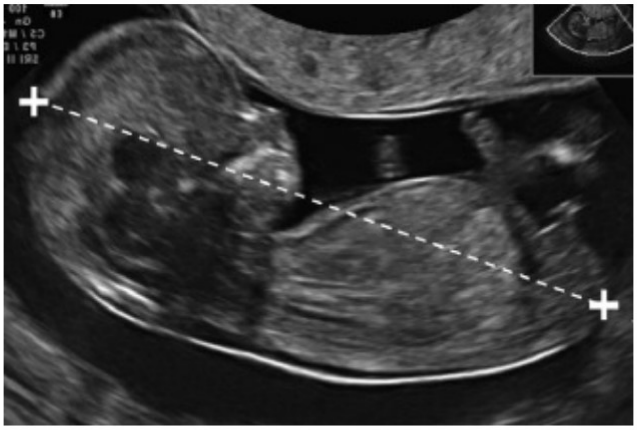

Figure 1 : Crown –rump length (CRL) measurement technique in a fetal with CRL (60mm) Note neutral position of neck.

Linear caliper is used to measure the fetus in neutral position, (neither flexed or hyperextended) yolk sac and limb bud should not be included. To ensure that fetus is not flexed amniotic fluid should be visible between fetal chin and chest. (fig 1)

In the first trimester many parameters are related closely to gestational age but CRL appears to be the most precise allowing accurate determination of the day of conception to within 5 days, either way in 95% of cases. Recent studies suggest that fetal growth patterns persistent at term may have precursors early in pregnancy; early diagnosis and intervention in cases of abnormal fetal growth may improve outcomes over the lifetimes of these individuals. Gestational age assessment by ultrasound is most accurate in the first trimester of pregnancy.

Aim

To correlate Crown-Rump Length between 6weeks and 13+6weeks to the birth weight of newborn.

Objectives

1. To correlate Crown-Rump Length between 6weeks and 13+6weeks to the birth weight of newborn.
2. To test the hypothesis that small or large for gestational age newborns have anomalous CRL in first trimester.

Materials and Methods

All antenatal mothers were advised to undergo first trimester ultrasound between 6 and 13 weeks + 6 days of gestation. The women were then followed up at the hospital with standard care till the end of pregnancy and finally the birth weights were noted. Correlation between CRL and Birth weight at term was analyzed for the participants that meet the criteria.

Type of the study: Prospective observational study

Sample size: 150

Duration of study: Study was conducted over a period of 18 months from January 2021 to June 2022.

Selection Criteria

Inclusion criteria: All pregnant women visiting OPD and IPD for antenatal care between 6weeks of GA TO 13weeks+6days GA in the Department of Obstetrics and Gynaecology in KIMSRH, Bangalore.

Exclusion Criteria: anomalous fetus.

Results

Birth weight of infants

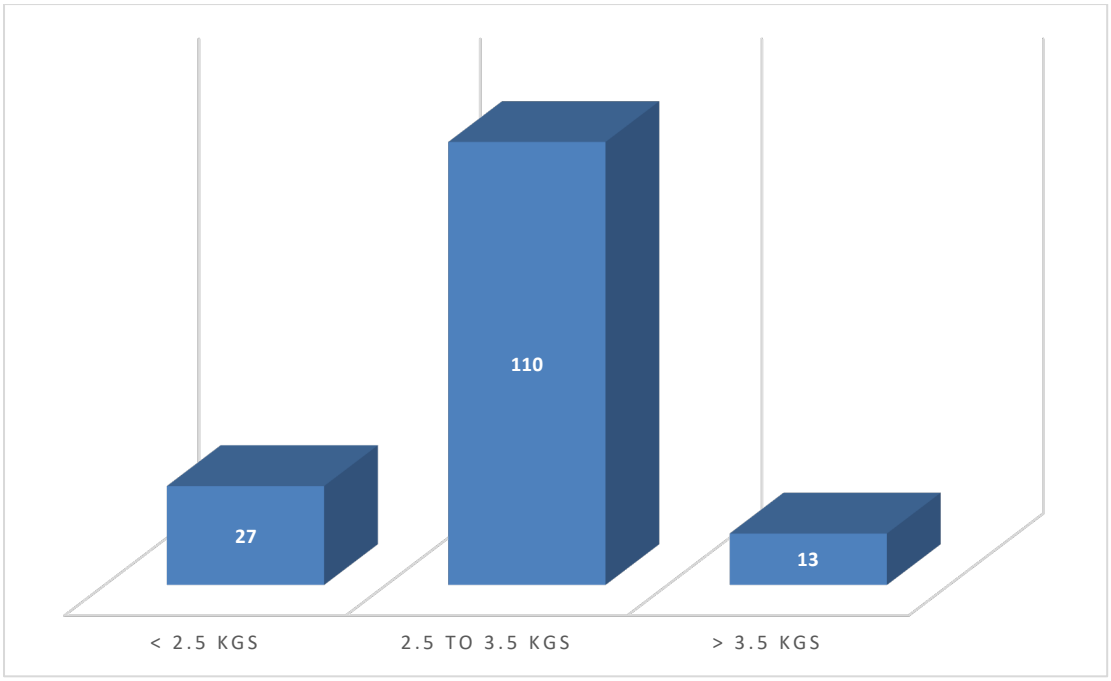

Figure 2: Birth weight of infants

In this study, 18% (27) infants were low birth weight and 8.66% (13) was of more birth weight than expected. 73.3% (110) was normal birth weight.

Relationship between CRL and low birth weight

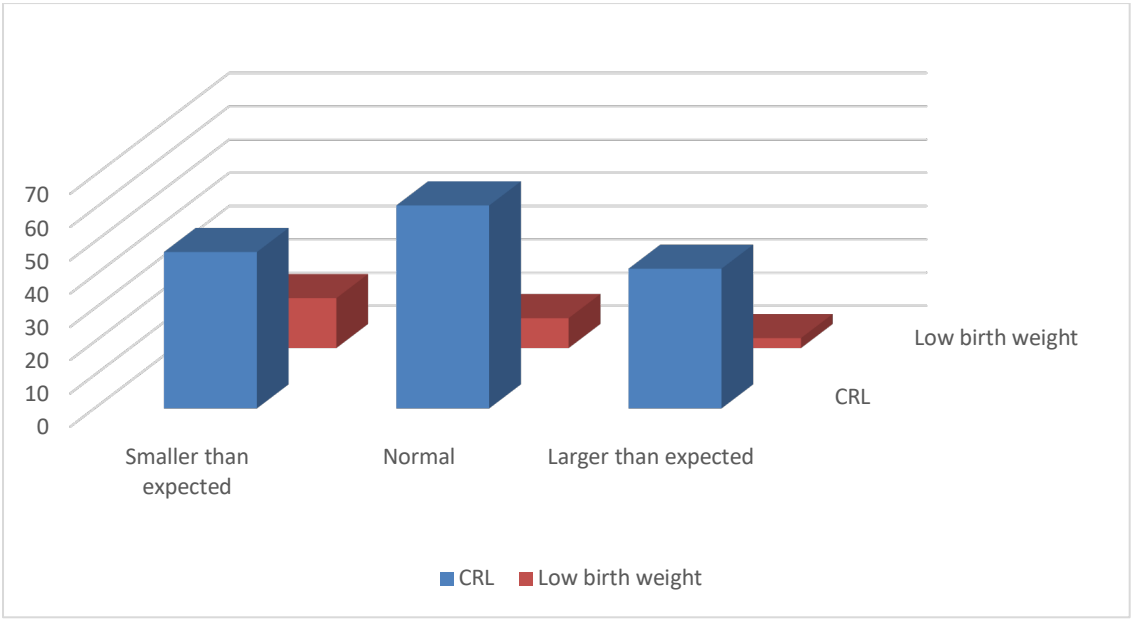

Figure 3: Relationship between CRL and Low birth weight in this study

47 out of 150 babies had crown rump length smaller than expected. Out of which 15 (31.9%) were low birth weight. 61 out of 150 babies were normal crown rump length, out of which 9(14.75%) had low birth weight. 42 babies had CRL larger than expected for that gestational age, out of which 3(7.2%) had low birth weight. There is no correlation between crown rump length and low birth weight in this study.

Table 2: Comparison of larger than expected crown rump length against presence of low birth weight smaller than expected crown rump length against low birth weight

	Birth weight (>3.5Kgs)	Low birth weight (<2.5Kgs)	Total
Smaller than expected CRL	32	15	47
Larger than expected CRL	39	3	42

- Odd's ratio is 0.61
- P value is <0.5 which is statistically not significant.
- Hence, low birth weight had an association with smaller than expected crown rump length, not with larger than expected crown rump length.

Table 3: Crown rump length association with low birth weight

CRL	Number	Low birth weight
Smaller than expected	47	15
Normal	61	9
Larger than expected	42	3

47 out of 150 babies had crown rump length smaller than expected. Out of which 15 (31.9%) were low birth weight. 61 out of 150 babies were normal crown rump length, out of which 9(14.75%) had low birth weight. 42 babies had CRL larger than expected for that gestational age, out of which 3(7.2%) had low birth weight. There is no correlation between crown rump length and low birth weight in this study.

Table 4: Association between crown rump length and birth weight of the baby

	CRL	BIRTH WEIGHT
N	150	
Mean	35.2418	2.9304
Variance	346.79	0.24
Std. Deviation	18.42	0.49
Std. Error	1.52	0.04

- Mean value of crown rump length is 35.24.
- Mean value of birth weight is 2.93
- p value is 0.101 which is statistically not significant Hence, there is no statistically significant correlation between crown rump length and birth weight in this study

Discussion

Various studies have been conducted in different parts of world to correlate between crown rump length and birth weight. The purpose of our study is to determine the relationship between crown rump length in the early first trimester and birth weight. On the basis of present study findings, there is no direct correlation between crown rump length and birth weight. In the first trimester the size of embryo or fetus differ from the expected size due to difference in the timing of ovulation. It is inferred that crown rump length is not a suitable reliable index of fetal growth and development.

There is evidence that fetal growth throughout pregnancy is not uniform even during the first trimester. The relationship between subsequent course of pregnancy and early fetal growth is difficult to interpret. Some environmental and genetic factors influence growth in both the first trimester and later pregnancy. As a result of factors such as abnormal placentation, a suboptimal environment may affect the growth earlier. Alternatively environmental factors like nutritional and hormonal might permanently affect fetal growth potentially encountered during the first trimester. Some fetuses may be physiologically small throughout pregnancy. Also maternal smoking and lack of folic acid supplementation is also associated with shorter CRL.

Summary

- In our study, 14 cases (9.34%) were between the GA 6-8weeks. 33 cases (22%) were between 9-10 weeks GA. 103 cases (68.6%) were between the GA of 11-13weeks+6days.
- In this study, 18% (27) infants were low birth weight whereas 8.66% (13) were more than expected birth weight.
- There is no correlation between fetus with anomalous CRL showing larger or smaller than expected birth weight
- Hence we conclude that in our study there is no significant correlation between CRL and birth weight.

Conclusion

- In our study Newborn who are found to have normal birth weight or low birth weight at delivery, don't appear to have anomalous crown rump length growth patterns in the first trimester.
- Further research is needed in large population in future to find the correlation between crown

rump length and birth weight, so that earlier and timely intervention can minimize the adverse neonatal outcome.

Limitations

- Limited duration of the study.
- Presence of multiple confounding factors affecting intrauterine growth rate.

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