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Crown-Rump Length at 11–14 Weeks as a Predictor of Large for Gestational Age Neonates: A Prospective Observational Study

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ABSTRACT

Background: Early identification of large for gestational age (LGA) neonates may reduce maternal and neonatal morbidity. Objectives: To evaluate whether first trimester crown-rump length (CRL) predicts LGA neonates. Methods: Prospective observational study of 172 singleton pregnancies. CRL measured at 11–14 weeks and followed till delivery.
Results: CRL correlated positively with birth weight (r=0.389, p<0.001). Mean CRL was significantly higher in LGA group (63.9±4.9 mm) compared to AGA (60.2±6.0 mm). ROC analysis showed AUC 0.691. CRL cut-off of 61.85 mm predicted LGA with 71.7% sensitivity and 66.1% specificity.
Conclusion: First trimester CRL is a useful early predictor of LGA neonates.

KEYWORDS:
Crown-rump length, Large for gestational age, First trimester ultrasound, Fetal growth, Gestational diabetes

I. INTRODUCTION

Abnormal fetal growth contributes significantly to perinatal morbidity and mortality. Large for gestational age (LGA) neonates are associated with shoulder dystocia, birth injuries, postpartum hemorrhage and long-term metabolic complications. Early antenatal prediction allows implementation of preventive strategies. Crown-rump length (CRL) is routinely measured in the first trimester and reflects early fetal growth. Recent evidence suggests that early embryonic growth trajectory influences final birth weight. This study evaluates CRL as a predictor of LGA in a South Indian population.

II. MATERIALS AND METHODS

This hospital-based prospective observational study was conducted at MIMS Hospital, Kozhikode from October 2020 to July 2021. Singleton pregnancies between 11–14 weeks were included. Exclusion criteria included multiple gestation, congenital anomalies, unreliable dates and chronic medical illness. Sample size was calculated with 80% power and 95% confidence. Ethical approval was obtained and informed consent taken. CRL measurements were done using standardized protocol by trained sonographers. Participants were followed till delivery. LGA was defined as birth weight >90th percentile. Also, predictive value of CRL obtained by comparing those of LGA and AGA(non LGA). And predictive accuracy of CRL for Diabetic and non diabetic LGA were compared. Statistical analysis was performed using SPSS v21. Pearson correlation, chi-square test and ROC curve analysis were used.

III. RESULTS

Mean maternal age was 28.5±4.3 years. Incidence of LGA was 34.9% (n=60). CRL showed significant positive correlation with birth weight (r=0.389, p<0.001). Mean CRL was significantly higher in LGA neonates (63.9 mm) compared to AGA (60.2 mm) (p<0.001). Gestational age (r=0.348, p<0.001) and maternal weight gain (r=0.209, p=0.006) also correlated with birth weight. ROC curve showed AUC of 0.691 (p<0.001). Gestational diabetes mellitus was significantly associated with LGA (p=0.012).

Table 1: Maternal Characteristics

Parameter	Value
Mean age	28.5 ± 4.3
Primigravida	53 (30.8%)
Multigravida	119 (69.2%)
Gestational diabetes	46 (26.7%)

Table 2: CRL Comparison

Group	Mean CRL (mm)	SD	p-value
LGA	63.9	4.9	<0.001
AGA	60.2	6.0	

Table 3: ROC Analysis

Parameter	Value
AUC	0.691
Sensitivity	71.7%
Specificity	66.1%
Cut off	61.85 mm

IV. DISCUSSION

Pardo et al. reported that embryos with higher CRL were more likely to deliver LGA neonates. Hackmon et al. demonstrated that macrosomia can be predicted as early as 11–14 weeks. Bukowski et al. found that each day increase in early fetal size significantly increased birth weight. Kang et al. showed stronger correlation with CRL measured in late first trimester. Salomon et al. emphasized moderate predictive accuracy of CRL.

The crown rump length at 11-14 weeks of gestation was good in predicting the large for gestational age babies with an AUC of 0.691 ($p<0.001$). The cut-off value of 61.85 was good in predicting large for gestational age babies with a sensitivity of 71.7% and a specificity of 66.1% based on the maximum Youden's index derived from the ROC curve coordinate. There was also a significant association between the gestational diabetes mellitus with the LGA neonates. The crown rump length was relatively better in prediction of LGA for mothers with gestational diabetes mellitus (AUC: 0.766 vs 0.652) when compared to mothers without gestational diabetes mellitus, although the results were not statistically significant.

Our findings are consistent with previous literature showing significantly higher CRL in LGA neonates. ROC analysis demonstrated moderate diagnostic accuracy suggesting CRL should be combined with maternal risk factors. Better predictive performance in gestational diabetes supports metabolic influence on fetal growth.

V. CLINICAL IMPLICATIONS

Early prediction of LGA allows timely dietary counseling, controlled gestational weight gain and early medical nutrition therapy. In diabetic mothers, strict glycemic control can reduce fetal overgrowth. Enhanced antenatal surveillance with serial growth scans allows planned mode of delivery, reducing shoulder dystocia, birth trauma, emergency cesarean section and postpartum hemorrhage. Early risk stratification may also reduce long-term metabolic disorders such as childhood obesity and type 2 diabetes.

VI. CONCLUSION

CRL measured at 11–14 weeks is a significant early predictor of LGA neonates. A cut-off of 61.85 mm provides good sensitivity and specificity. Larger multicentric studies are recommended for validation.

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