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CORRELATION BETWEEN BIRTH WEIGHT AND OTHER ANTHROPOMETRIC PARAMETERS

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ABSTRACT There is high incidence of low birth weight newborns in India. Several of these deliveries are conducted at home where accurate weighing scale may not be available. There is need to have other anthropometric parameter which can accurately correlate with birth weight . **AIM** This study was aimed to find anthropometric parameter which can correlate with birth weight accurately.**METHODS -** 254 newborns delivered by normal delivery were examined and anthropometric measurements mid arm circumference (MAC) ,mid thigh circumference (MTC) j, calf circumference (CC), crown heel length (CHL), head circumference (HC), chest circumference (ChC) and birth weight (BW) were carried out. **RESULTS** Calf circumference had highest sensitivity and comparable specificity with chest circumference. Chest circumference had highest correlation with Birth weight followed by Calf circumference.

KEY WORDS : anthropometric parameter, low birth weight, calf circumference, chest circumference.

INTRODUCTION

Thirty percent of total birth in India are low birth weight which is severe hinderance to development.(1,2) It accounts for more than 50 percent of perinatal deaths and nearly 1/3 of infant deaths. Morbidity associated with LBW babies is also very high(3). Almost 80% of deliveries in India occur at home and in community setting conducted by trained or untrained birth attendants which lack the basic facilities like accurate weighing scales. This study was planned to find a reliable alternative method to identify low birth weight (LBW) babies.

AIM

This study was designed to find methods to detect LBW with various anthropometric parameters, to check their reliability in Indian scenario. It was designed to find best parameter to correlate with birth weight.

MATERIAL AND METHODS

In this hospital based study 254 term normal singleton live newborn babies delivered per vaginum were included. The newborn with congenital anomalies, chromosomal anomalies and hemolytic diseases were excluded. Following anthropometric measurement were carried out in supine posture within 24 hrs of birth. Birth weight (BW) on lever type weighing scale to the nearest of 50 gm, mid arm circumference (MAC) at the midpoint between acromian and olecranon process, mid thigh circumference (MTC) just below the most inferior gluteal folds, calf circumference (CC) at the most prominent part of leg in the semiflexed posture, crown heel length (CHL) with infantometer, head circumference (HC) by passing flexible fibre glass measuring tape around the head over the most prominent part, chest circumference (ChC) at the level of xiphisternum anteriorly and inferior angles of scapula posteriorly. The data thus obtained was analysed statistically by using correlation matrix, regression equations, sensitivity and specificity.

OBSERVATIONS

The mean values for various parameters along with standard error were : BW (2846.35 +_429.41 gm) CC (9.99+_ 1.324gm) MTC (13.56+_2.175 gm) MAC (9.73+_ 1.217 cm) , CHL (47.36+_ 3.198 cm), HC (33.21+_ 1.548 cm) ChC (31.24+_ 16.02 cm). Correlation matrix of all the anthropometric variable was derived. It showed that all the parameters had significant correlation with birth weight (table 1) . The highest correlation was the chest circumference (0.753) followed closely by calf circumference (0.734). The HC also showed a high degree of correlation (0.712) which was comparable to that of chest and calf circumference. The values for MTC, MAC, CHL were much lower than that of chest, calf and head circumference.

The data was further subjected to linear regression keeping birth weight as dependent variable and R value was derived as in Table 2. Combined R value was 66.5% with all the six variables when regressed with BW. It was also evident from Table 2 that t- value was not significant for MAC, MTC, CHL and so they were deleted from further analysis. Regression analysis was further carried out with CC, HC, ChC and R was 65.6% It was evident that even after deletion of 3 of the parameters , predictive values of model did not change much. Since the study was to find BW surrogates so various anthropometric parameters were regressed with BW and regression equations were derived. Depending on these equations , regression lines were drawn and from these lines cut off values for identifying 2500 gm of birth weight were calculated which were 8.5 cm for calf circumference , 30.0 cm for chest circumference and 32.0 cm for head circumference. Using the above cut off values, various anthropometric variables were comparatively assessed by determining their sensitivity , specificity, positive and negative predict values (Table 3) which showed that calf circumference had highest sensitivity and comparable specificity with chest circumference. Calf circumference also had highest negative predictive values and positive predictive value less than that of chest circumference.

DISCUSSION

Anthropometry provides a simple and objective method of assessment of fetal growth at the time of birth. Some recent studies have documented CC as a better predictor of LBW(4,5,6,7,8). From observations of the present study , it was evident that calf and chest circumference had high correlation with BW (0.734cm, 0.753 cm respectively) (9). Other anthropometric parameters like MAC, ChC did not show any significant correlation between with BW as also observed by other authors (5,9,10).

The predictive power R of the model was 66.5%. When all the six anthropometric parameters were combined, 53.8% of predictive values of model was contributed by calf circumference alone. CC combined with either HC or CC had a predictive power of 64.7% and 62.8% respectively. A comparable value of R is obtained for 2 combined variables viz ChC and CC, CC, HC and addition of other parameters did not change the predictive power of the model

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much. Previous studies had shown cut off value of 10 cm for calf circumference with a sensitivity of 79%(8,11). In the present study a cut off valve of 8.5 cm for CC showed a specificity of 92.7%.

Thus we conclude that CC is best simple practical and cost effective alternative to BW but needs to be studied extensively to get the mean values at birth as well as the cut off value based upon which colour tapes can be made to be used by health care workers for identifying LBW babies

CONCLUSIONS

The parameters studied included mid arm circumference (MAC) ,mid thigh circumference (MTC) j, calf circumference (CC), crown heel length (CHL), head circumference (HC), chest circumference (ChC) and birth weight (BW) correlation matrix and regression equations were derived which showed that ChC had highest correlation with BW (0.753) followed by CC (0.732) and HC (0.712) Regression analysis of data gave a cut off value of 8.5 cm for calf circumference for 2500gm of birth weight which showed 92.7% specificity for identifying low birth rate babies.

Table 1- Correlation matrix of various parameters (* Indicates statistically significant at p< 0.05

	BW	CC	MAC	MTC	CHL	HC	ChC
BW	1.00						
CC	0.734*	1.00					
MAC	0.599*	0.684	1.00				
MTC	0.637*	0.779	0.703	1.00			
CHL	0.465*	0.458	0.390	0.526	1.00		
HC	0.712*	0.662	0.613	0.742	0.599	1.00	
ChC	0.753*	0.771	0.624	0.705	0.534	0.816	1.00

Table 2- Linear regression keeping birth weight as dependent variable R= 0.6651. Adjusted R= 0.6570. * Significant

Variable	Coef B	S.E.	t-ratio
Constant	3230.39	433.87	7.445*
CC	128.93	21.98	6.115*
MAC	23.90	19.50	1.225
MTC	24.39	13.87	1.758
CHL	1.67	6.26	0.267
HC	63.61	20.09	3.166*
ChC	86.21	18.71	4.606*

Table 3- Sensitivity, Specificity, Positive predictive value and Negative predictive value of various parameters

Variable	Sensitivity	Specificity	Positive predictive value	Negative predictive value
CC	70.7	92.4	64.4	94.2
ChC	60.0	92.7	70.58	92.7
HC	59.5	91.9	56.8	91.9

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