ALTERNATIVE PREDICTORS OF LOW BIRTH WEIGHT

Vandana Kakrani¹, Vimal Holambe², Sarasvati Garad³, Anagha Gupte⁴

ABSTRACT

Objective-To find out simple and reliable alternative predictor of birth weight to identify low birth weight babies.

Setting-Postnatal ward of Sassoon General Ward Pune'.

Participants-All newborn babies born after normal delivery having birth weight less than 2500gms over a period of one year.

Methods-The LBW babies included in the study were subjected to various measurements i.e. head, chest, calf circumferences and crown rump, crown heel, foot lengths as per the recommended procedures. Statistical Analysis-Results were analysed using 't' test, correlation coefficient, sensitivity, specificity at appropriate places.

Results- out of total 934 LBW babies studied, about (20%) were having birth weight less than 2000gms. Various measurements studied showed that a cut off point of 9.5cm for MAC, 9.6 cm for calf circumference and 31.5cm for head, 6.75cm for foot length can be used to predict birth weight less than 2000 gms.

Conclusion-These simple low cost proxy measurements can be of help in rural areas where weighing machines may not be available for identification of LBW babies below 2000 gms who need referral for special neonatal care.

Key Words: LBW, Alternative Predictors, Neonatal anthropometry

INTRODUCTION

The birth weight of newborns is the single most important determinant of its chances of survival as well as healthy growth and development. A full term normal newborn weighing less than 2500 gms at birth is termed as Low Birth Weight (LBW) infant.¹ Globally 17% of approximately 142 million newborns have low birth weight, of these 95% are in the developing countries². World health report has stated the occurrence of LBW in India to be approximately 33%.³ Low Birth Weight contributes to high mortality and morbidity, half of perinatal and third of infant mortality can be attributed to it.³

Birth weight is used as a measure of Low Birth Weight because of its correlation with gestation and ease of recording in hospital setting. However in our country 70 to 90% of deliveries are conducted at home by trained birth attendants or untrained relatives where weight recording is a problem ⁴. If these personnel are trained to take anthropometric measurements at birth and accordingly identify LBW babies, appropriate care of these LBW babies can be undertaken at the earliest. Therefore a study was conducted to find an alternate, simple, low cost, reliable predictor of birth weight to identify LBW newborns.

MATERIAL AND METHODS

The study was conducted at Sassoon General Hospital Pune, for a period of one year. All babies born by normal delivery with birth weight of less than 2500 gms were included after taking their weight within 24 to 48 hours. Babies born with congenital anomalies, twins or seriously ill babies at NICU were excluded from the study. After taking preliminary information from mother, health education was given to mothers of LBW babies about their appropriate special care.

1. Associate Professor, 2. Postgraduate Student, 3& 4. Statistician, Dept.of Preventive & Social Medicine, BJ Medical College Pune

Postl Address : Dr Vandana Kakrani, Associate Professor, Dept of PSM, B J Medical College, Pune 411001

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Anthropometric measurements taken included head circumference, chest circumference, calf circumference, crown heel length, crown rump length and foot length as per the recommended procedures by the same investigator. Every measurement was recorded three times and the average was taken as the final measurement. Care was taken to standardize the instruments daily. The instruments used were digital weighing machine to record the weight with the accuracy of 10gms, measuring tape for measuring head, chest and calf circumference with the accuracy of 0.1cm, infantometer to measure crown heel and crown rump length with a scale of minimum of 0.1cm. Foot length caliper especially prepared for the purpose was used which was calibrated to measure foot length to nearest 0.1cm.

Correlation coefficient was used for correlation of various measurements with birth weight. Sensitivity and specificity was calculated to arrive at cut off values as predictors and T test was applied to compare the means between two groups ie below and above 2000gm birth weights.

RESULTS

A total of 934 low birth weight babies were studied, of which 752(80.5%) were having birth weight more than 2000gms, 174(18.6%) had birth weight between 1500 to 2000gms while only 8 (0.85%) were having birth weight less than 1500gms.

It is the LBW babies having less than 2000gms weight which are considered as “at risk” babies who need special neonatal care for which hospitalization in special neonatal care units is recommended for further survival. Therefore the measurements are compared in two groups having birth weight below and above 2000gms.

In the present study all the anthropometric parameters highly correlated to each other as well as with birth weight which is taken as the gold standard against all these parameters. The mean, SD and correlation coefficient of each parameter with birth weight is shown in table 1

Table 1: Correlation coefficients of different anthropometric parameters with birth weight (n=934)

<table>
<thead>
<tr>
<th>Anthropometric Parameter</th>
<th>Mean ± SD (cm)</th>
<th>Correlation Coefficient With BW</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHL</td>
<td>43.51 ± 3.67</td>
<td>0.662</td>
</tr>
<tr>
<td>CRL</td>
<td>28.11 ± 2.06</td>
<td>0.519</td>
</tr>
<tr>
<td>MAC</td>
<td>9.47 ± 0.61</td>
<td>0.755</td>
</tr>
<tr>
<td>Calf Circumference</td>
<td>9.41 ± 0.56</td>
<td>0.728</td>
</tr>
<tr>
<td>Chest Circumference</td>
<td>28.85 ± 1.98</td>
<td>0.650</td>
</tr>
<tr>
<td>Head Circumference</td>
<td>31.29 ± 1.77</td>
<td>0.641</td>
</tr>
<tr>
<td>Foot Length</td>
<td>6.67 ± 0.47</td>
<td>0.704</td>
</tr>
</tbody>
</table>

Table 2 shows the mean and SD of CHL and CRL. It was observed that as compared to less than 2000 gm group there was significant increase in the values of CHL and CRL in the group having birth weight more than 2000 gm and the difference was highly significant.

Table 3 shows the mean and SD of calf and mid arm circumference, both these measurements increased with increase in birth weight and the difference between the two groups is highly significant.
Table 4 shows that with increase in birth weight there is significant increase in head and chest circumference of the LBW baby.

<table>
<thead>
<tr>
<th>LBW</th>
<th>No.</th>
<th>Chest Circumference (cm)</th>
<th>Head Circumference (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1500</td>
<td>8</td>
<td>25.75 ± 1.67</td>
<td>30.12 ± 2.8</td>
</tr>
<tr>
<td>1500-&lt;2000</td>
<td>174</td>
<td>26.89 ± 1.47</td>
<td>29.63 ± 1.61</td>
</tr>
<tr>
<td>2000+</td>
<td>752</td>
<td>29.34 ± 1.77</td>
<td>31.69 ± 1.55</td>
</tr>
<tr>
<td>Total</td>
<td>934</td>
<td>28.85 ± 1.98</td>
<td>31.29 ± 1.77</td>
</tr>
</tbody>
</table>

Comparison between two groups: BW <2000gm & 2000+gm
Z=17.86, p<0.0001 Highly Significant
Z=9.27, p<0.0001 Highly Significant

Foot length measurement was also found to be significantly different in three groups (Table-5).

<table>
<thead>
<tr>
<th>LBW</th>
<th>No.</th>
<th>Foot Length (cm)</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1500</td>
<td>8</td>
<td>6.28 ± 0.39</td>
<td></td>
</tr>
<tr>
<td>1500-&lt;2000</td>
<td>174</td>
<td>6.19 ± 0.25</td>
<td></td>
</tr>
<tr>
<td>2000+</td>
<td>752</td>
<td>6.78 ± 0.44</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>934</td>
<td>6.67 ± 0.47</td>
<td></td>
</tr>
</tbody>
</table>

Comparison between two groups: BW <2000gm & 2000+gm
Z=17.87, p<0.0001 Highly Significant

Sensitivity and specificity for different values of these measurements was tried at different cut off points which could predict LBW and the cut off value showing maximum sensitivity was obtained. The cut off points selected with maximum sensitivity which predicted the LBW babies below 2000 gms were 9.5, 6.75, 9.6 and 31.5 for mid arm, foot length, calf and head circumference respectively.

DISCUSSION
Of all the anthropometric parameters used in assessing LBW babies, birth weight is regarded as gold standard. In rural areas weight recording is often not done either due to non-availability of weighing scales or the weighing machines are out of order. In some remote areas where deliveries are conducted at home there is time lapse of more than 48 hrs or sometimes upto 7 to 10 days between delivery and first contact by health worker. Therefore if some alternative anthropometric measurements are available to predict birth weights, it can serve as a proxy for birth weight. It is extremely necessary to identify LBW babies having weight less than 2000 gms as they need special care by referral to neonatal care units for survival. The babies having birth weight between 2000 gms to 2500 gms can be considered functionally mature enough and domiciliary care will be sufficient for such babies to improve their further growth and survival.

In the present study all the anthropometric parameters highly correlated to each other as well as with birth weight which is a gold standard against all these parameters. Similar observations are reported in other study where head, calf, chest and MAC as well as abdominal circumferences highly correlated to each other.

The mean values of various measurements i.e. CHL, CRL, MAC, calf, chest and head circumference and footlength were 43.51 cm, 28.11 cm, 9.47 cm, 9.81 cm, 28.85 cm, 31.29 cm and 6.67cm respectively. In a similar study for birth weight less than 2500 gm critical limit for calf was 10.8 cm or less for CHL, head, chest, MAC, thigh circumference was equal to less than 45.2 cm, 32.2 cm, 30.1 cm, 9.0 cm, 15.4 cm. The highest sensitivity for detecting LBW infants was found for calf (94.4%) followed by thigh (91.6%) and head circumference(90.4%).While in the present study highest sensitivity was for FL (92.8%),for detecting LBW less than 2000gms followed by MAC (89.5%) and calf circumference (87.9%). Many studies have reported positive correlation between Foot length and other indices of body.

Mid arm circumference has also been shown as simple and valid method of screening LBW babies. A positive correlation existed between MAC and birth weight and a MAC of 8.7 cm predicts birth weight of 2580gm and definitely excludes newborns with birth weight less than 2000gm.
Thus simple, low cost and reliable anthropometric measurements can be used by health workers to predict birth weight so as to identify LBW babies’ immediately after birth and to decide on the need for either home management or further referral to special neonatal care units to improve their survival.

REFERENCES