Evaluation of Newborn Arm Circumference as an Indicator of Low Birth Weight

João Guilherme Bezerra Alves, Geisy Maria de Souza Lima, Geiser Nery da Costa Azevedo, Virginia Buarque Cordeiro Cabral, Ruben Schindler Moggi, & Roberto Nunes

A sample of 1,024 newborns in Recife, Brazil, was studied to help determine the precision with which arm circumference measurements could be used to indicate low birth weight. The results support the view that when birth weight data are unobtainable, arm circumference measurements may be of value in screening for newborns needing special care.

Low birth weight (LBW), defined by the World Health Organization as a weight of less than 2,500 g at birth, is closely associated with high morbidity and mortality in the first year of life. The incidence of LBW varies with socioeconomic conditions, ranging from 2–4% in industrialized countries to rates exceeding 15% in developing countries. The result is that 90% of the 15 million LBW babies that come into the world each year are born in developing countries (1, 2).

In the rural areas of the Brazilian Northeast, where LBW and infant mortality have risen in a similar fashion since 1982, more than half of all babies are delivered at home. This creates difficulties for determining birth weight—difficulties only heightened by the fact that even in-hospital deliveries often lack access to proper equipment in good working order for determining the weight of the newborn (3, 4).

Measurement of arm circumference, already widely used as a parameter for determining malnutrition in older children (5–8), has previously been described as useful for detecting low-weight newborns in the neonatal period (9). In this regard, some authors have found a strong association between an arm circumference below 9 cm and a birth weight of less than 2,500 g (9, 10).

Because this measurement method is so simple and practical as to be usable in virtually any primary or other health care facility, our study sought to determine the sensitivity and specificity of arm circumference as an indicator of LBW in a group of babies born in the Northeast Brazilian city of Recife in 1988.

MATERIALS AND METHODS

The study population consisted of 1,024 infants born at the Women's Care Center at the Maternal and Child Insti-
A newborn infant’s arm circumference being measured in the course of the study.

tute of Pernambuco (IMIP) from July to December 1988. All the infants were weighed within the first hour of life by one of the researchers and were evaluated in terms of the WHO definition of low birth weight.

In addition, each newborn’s arm circumference was measured by two of the researchers working separately, and the average of the two measurements was taken as the final result. These readings were made with a Japanese fiberglass tape measure graduated in 0.1 cm increments, which was always placed gently and firmly at the midpoint of the left arm with the infant supine.

RESULTS

The weights of the study infants ranged from 960 g to 4,300 g, the mean being 3,101 g with a standard deviation of 582 g. Their arm circumferences were in a range of 6.0–12.1 cm, the average being 9.98 cm and the standard deviation 0.97 cm. The respective frequencies of low birth weight and an average arm circumference below 9 cm were 12.00% and 12.51%, respectively, with a correlation coefficient of +0.79. Data regarding the sensitivity and specificity of arm circumference as an indicator of low birth weight are shown in Table 1.

DISCUSSION AND CONCLUSIONS

Low birth weight was found in 12% of the cases studied, a frequency similar to that found by the Brazilian Pediatric Society in the city of Recife in 1986 (11). In this same vein, Dias et al. (3) found that the frequency of low birth weight in Recife rose from 10.20% in 1982 to 15.30% in 1984. Nationally, low birth weight and infant mortality have exhibited a noteworthy rise in Brazil since 1982, trends that have accompanied the economic downturn confronting the country.
Table 1. Sensitivity and specificity of different newborn arm circumference values for determining low birth weight.

<table>
<thead>
<tr>
<th>Average arm circumference (cm)</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7.5</td>
<td>24.4</td>
<td>100.0</td>
</tr>
<tr>
<td>&lt; 8.0</td>
<td>40.6</td>
<td>100.0</td>
</tr>
<tr>
<td>&lt; 8.5</td>
<td>65.0</td>
<td>99.6</td>
</tr>
<tr>
<td>&lt; 9.0a</td>
<td>84.5</td>
<td>94.9</td>
</tr>
<tr>
<td>&lt; 9.5</td>
<td>98.3</td>
<td>79.0</td>
</tr>
<tr>
<td>&lt; 10.0</td>
<td>100.0</td>
<td>54.3</td>
</tr>
</tbody>
</table>

a Positive predictive value = 90.4%, negative predictive value = 98.3%.

References