DETECTION OF FETAL MALNUTRITION AT BIRTH BY CLINICAL ASSESSMENT OF NUTRITIONAL STATUS SCORE (CANSORE)

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Abstract

Objective: Clinical assessment of nutritional status of neonate using CANSORE and comparison with other methods of determining fetal malnutrition.

Design: Cross sectional study.

Setting: Tertiary care hospital.

Study Subjects: 384 liveborn singleton neonates with known gestational age and no major congenital malformation.

Methods: Birth weight, length, midterm circumference and head circumference recorded in newborns. Ponderal index and mid arm to head circumference ratio was calculated. Clinical assessment of nutritional status was done on the basis of CANSORE score and compared with other methods.

Results: CANSORE score < 25 separated 67.71% of the babies as well nourished and 32.29% as malnourished. Weight for age and MAC/HC classified nearly 70% of babies as well nourished and 30% as malnourished. Also Ponderal Index classified 75.52% the babies as well nourished and 24.48% as malnourished.

Conclusion: CANSORE score may be a simple clinical index for identifying fetal malnutrition and for prediction of neonatal morbidity associated with it, without the aid of any sophisticated equipments.

Key Words: CANSORE score, Fetal malnutrition.

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(MAC/HC) ratios were calculated from these measurements. A PI of < 2.2 and MAC/HC ratio < 0.27 were considered as malnutrition. A birth weight of less than 2500 grams was used for defining fetal malnutrition.

Clinical Assessment of Nutrition (CAN): Clinical assessment of nutritional status was done on the basis of the superficial readily detectable signs of malnutrition in the newborn as described by Metcoff. A CAN score of < 25 was used to define fetal malnutrition. This score offered the best breakpoint between growth retarded and normal infants as determined by weight for age.

Figure 1: Nutritional assessment by CANSCORE system (1-9 criteria)
### Statistical Analysis

The observations were statistically analyzed on EPI INFO version 7 with test of significance calculated by Chi square test. Sensitivity, specificity, positive and negative predictive value were also calculated as validity measures for CANSCORE wherever required.

### Results

Table 1 shows the Summary statistics on Anthropometric parameters of study subjects. All the babies in the study (n=384) comprised of full term infants with Mean Gestational age $39 \pm 0.95$ wks. Mean birth weight of study population was $2657 \pm 392$ grams, the mean length was $48.8 \pm 1.83$ cm, the mean mid arm circumference was $9.28 \pm 0.85$ cm and the mean head circumference was $34.2 \pm 0.85$ cm.

**Table 1 – Summary statistics on Anthropometric parameters of study subjects**

<table>
<thead>
<tr>
<th>Anthropometric Parameters</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Weight (gm)</td>
<td>2657.69</td>
<td>± 392.76</td>
<td>1750 – 4008</td>
</tr>
<tr>
<td>Birth Length (cm)</td>
<td>48.8</td>
<td>± 1.83</td>
<td>43 – 54.2</td>
</tr>
<tr>
<td>Head Circumference (cm)</td>
<td>34.2</td>
<td>± 0.85</td>
<td>30 – 36.7</td>
</tr>
<tr>
<td>Mid arm Circumference(cm)</td>
<td>9.28</td>
<td>± 0.85</td>
<td>7.2 – 10.4</td>
</tr>
<tr>
<td>Ponderal Index</td>
<td>2.3</td>
<td>± 0.25</td>
<td>1.66 – 3.3</td>
</tr>
<tr>
<td>MAC/HC ratio</td>
<td>0.27</td>
<td>± 0.013</td>
<td>0.23 – 0.31</td>
</tr>
</tbody>
</table>

Distribution of study population as well nourished (WN) and malnourished (MN) according to different methods is depicted in Table 2. The CANSCORE classified 32.29% as malnourished and 67.71% as well nourished. Birth Weight classified 29.43% as malnourished and 70.57% as well nourished, MAC/HC ratio classified 29.95% as malnourished and 70.05% as well nourished, while Ponderal Index classified 24.48% as malnourished and 75.52% as well nourished. Comparison of validity measures of CANSCORE with other methods for detection of fetal malnutrition is given in

Table 3 The odds ratio (95% CI) for identifying malnutrition using CANSCORE compared to birth weight, PI and MAC/HC ratio were 1.99 (1.24-3.19), 1.74 (1.06-2.86) and 1.53 (0.97-2.44), respectively.

### Discussion

Low birth weight is a major public health problem in India in contrast to what is observed in most developed and many developing countries of the world. Two third of these low birth weight babies are with fetal malnutrition (9). It has been shown that fetal malnourished (growth retarded) babies differ in etiology, neonatal morbidity,
mortality and later development from term appropriately grown infants (12).
Most of the classification systems for malnourished babies are based on observed birth weight either below or more than or equal to 2500 grams (3,13-15). However, none of the above classification system identifies fetal malnutrition, a term coined by Scott and Usher(16), which indicates a clinical state that may be present at almost any birth weight irrespective of classification of infants into normal birth weight or low birth weight. When CANSCORE is compared with Birth Weight it gave a sensitivity of 84.68% and specificity of 96.92%

The clinical manifestation of fetal malnutrition depends in part on the timing it began during gestation. It is characterized by obvious intrauterine loss of, or failure to acquire normal amount of subcutaneous fat and muscle. Weight, length and head circumference may or may not be affected.

Ponderal index has also been used by various authors to classify intrauterine growth retarded infants. Miller and Hassanein(11) proposed that a full term infant is growth retarded if his PI is < 2.2.

Ponderal index relies on the principle that length is spared at the expense of weight during period of acute malnutrition; weight and length velocities may be proportionately impaired so infants with chronic insult in utero may be misclassified by PI. When CAN score was compared with Ponderal Index it gave a sensitivity of 61.29% and a specificity of 93.08% in the present study.

Meadow and colleagues (17) concluded that the MAC/HC ratio, independent of birth weight, readily discriminated the late gestation growth retarded baby. Their study showed that this ratio can be used as a reliable test to identify neonates whose growth is retarded, even when their weight is normal. But those babies whose head circumference is reduced because of proportionate growth retardation might not be identified. The low value in this study might indicate the chronic stress these infants face in utero. CANSCORE gave a sensitivity of 75.81%and specificity of 91.92% with MAC/HC ratio. The study re-emphasizes the observations of Metcoff that fetal malnutrition and it is a clinical diagnosis, independent of birth weight for gestational age. The advantage of CAN score is that it is a simple, clinical index for identifying fetal malnutrition and may have the potential to predict neonatal morbidity associated with it without the aid of any sophisticated equipments. A larger subject population would be required to establish the utility of CANSCORE as a good clinical index for predicting neurodevelopment outcome in infants with fetal malnutrition.

REFERENCES

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