

CLINICAL STUDY OF NUTRITIONAL STATUS IN TERM NEWBORNS

Zaheer Ahamed¹, Prasad nayak², Aravind Pallipady³.

1. Senior Resident, Department of Pediatrics, A J Institute of Medical Science, Mangalore.
2. Assistant Professor, Department of Pediatrics, A J Institute of Medical Science, Mangalore.
3. Associate Professor, department of Pathology, A J Institute of Medical Science, Mangalore.

CORRESPONDING AUTHOR:

Dr. Aravind Pallipady
Door no: 3-90, behind Kannur,
Telephone Exchange, P.O,
Kannur Mangalore 575007.
Email- aravindpatho@gmail.com

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ABSTRACT:- OBJECTIVE: clinical assessment of nutritional status of neonate using CAN score and comparison with other method of assessing intrauterine growth. **DESIGN:** cross sectional study. **SETTING:** tertiary care hospital. **SUBJECTS:** 314 liveborn singleton newborns with known gestational age and no major anomalies. **METHODS:** birth weight, length was recorded and ponderal index was calculated. Clinical assessment of nutritional status was done on the basis of CAN score and compared with Ponderal index. **RESULTS:** CAN score of <24 separated 60 % of the babies as well nourished and 40% as malnourished. Weight for age and Ponderal Index both classified around 87% as well nourished and 13% as malnourished. **Conclusion:** CAN scoring along with other anthropometric parameters like birth weight will be giving more accurate information regarding intrauterine malnutrition in newborn babies.

KEY WORDS: CAN score, fetal malnutrition

INTRODUCTION: Fetal malnutrition is a common and potentially serious problem, perinatally and for later growth and development. it is important to recognize intrauterine growth retarded babies because of high incidence of neonatal morbidity and long term sequelae. Usually the clinical classification of small for gestational age (SGA) babies is based on the observed birth weight below the 10th percentile for the gestational age. Certain infants are genetically predetermined to be excessively large and may manifest fetal malnutrition by soft tissue wasting and chronic fetal asphyxia even though they do not fall below normal range for weight for date. A simple rapid quantifiable clinically applicable scoring system called CANS score to differentiate malnourished from appropriately nourished babies irrespective of birth weight or clinical classification of IUGR, SGA or Appropriate for gestational age. This scoring system rated clinical evidence of malnutrition in term babies determined by inspection and by estimating the loss of subcutaneous tissue and muscle. Ponderal index is other measurement that can be used to identify at risk intra uterine growth retarded infants¹

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MATERIALS AND METHODS: This study was carried out on 315 live term newborn babies born at Pushpagiri Medical College Hospital, Tiruvalla, Kerala in a 6 month period from June 2006 and December 2006.

INCLUSION CRITERIA: Live born term infants with gestational age of more than 37 weeks on basis of New Ballard scoring, with no congenital anomalies,

METHODS: Detailed physical examination was done with special emphasis on congenital anomalies and evidence of intrauterine infection and neonatal complications. Further they were classified into Appropriate for gestational age (AGA), Small for gestational age (SGA) and Large for gestational age (LGA) based on birth weight for gestational age as per intrauterine growth chart of NCHS.

The birth weight was recorded on a electronic weighing machine. head circumference , length was measured using standard techniques between 24-48 hours of birth .Certain derived indices like Ponderal index (PI) , were calculated with $PI < 2.2$ was considered as Malnutrition. Finally CANS scoring was done for all babies; within 48 hours on the basis of the superficial readily detectable signs of malnutrition in the newborn as described by Metcoff. ³(table 1) and were classified into Fetal Malnutrition (FM) group if CAN score was ≤ 24 and Well Nourished group if CAN score was >24 .

RESULTS: The study population comprised of 163 males and 152 females out of total 315 term newborns. Mean birth weight of study population was 2.865 ± 0.37 kg; mean length was 48.21 ± 1.97 cm,

Distribution of study population as well nourished and fetal malnourished according to different methods is depicted in table 1.

TABLE 1

Distribution of Well nourished and Fetal Malnourished by various methods

Category	Birth weight for gestation	Number (%)	CANS	Number (%)	Ponderal Index	Number (%)
WN	AGA	276 (88)	>24	189 (60%)	≥ 2.2	274 (87%)
FM	SGA	38 (12)	≤ 24	126 (40%)	< 2.2	41 (13%)

WN- Well Nourished. FM - Fetal Malnourished

TABLE 2

Comparison of can score with other methods for detection of fetal malnutrition

value	Ponderal index	Birth weight for gestation
Sensitivity (%)	25.39 %	73.8%
Specificity (%)	95.23 %	2.6%
Positive predictive value (%)	78.04 %	33.6%
Negative predictive value (%)	65.69 %	13%

TABLE 3

Attribute	Total no. of babies	FM	WN	% FM
AGA	276	93	183	33.69
SGA	38	33	5	86.84
LGA	1	0	1	0
Total	315	126	189	40

CAN Scoring of babies show even AGA babies can have features of malnutrition (33.69%) and SGA babies might not be malnourished (13.16%). These observations indicate FM and IUGR/SGA are not synonymous and can occur without each other

DISCUSSION: A thorough knowledge of fetal malnutrition is critical to our understanding of clinical problems, such as In utero growth restriction, fetal macrosomia and nutritional needs of the preterm infant. The extremely rapid growth of the fetus accounts for a significant fraction of the nutrients required by the fetus throughout gestation. Fetus is not a true parasite. It extracts only 2-4 % of the nutrients reaching it from the placenta, 96% to 98% being returned to the placenta and maternal circulation². It can be underfed or over nourished depending on extraction, nutrient composition of the umbilical blood, flow rate and the capacity to utilize the extracted nutrients⁴

Most of the classification systems for intrauterine growth retarded babies are based on observed birth weight below the 3rd or 10th percentile for gestational age estimated by use of various growth curves⁵. However none of the above classification system identifies fetal malnutrition, a term coined by Scott and Usher, which indicates a clinical state that may be present at almost any birthweight irrespective of classification of infants into appropriate for gestational age (AGA), intrauterine growth retardation (IUGR) or small for gestational age (SGA) categories⁶.

The clinical manifestations of fetal malnutrition depend in part on when it began during gestation⁷

- a) Malnutrition beginning early in the second trimester-length, head circumference and weight are significantly reduced.
- b) Malnutrition beginning early in the third trimester -length and head circumference are less affected, but are small and underweight with some loss of sub cutaneous tissues and muscle.
- c) Malnutrition -late in the third trimester-significantly underweight for gestational age with obvious loss of subcutaneous tissue, but with length and head circumference within normal range.

CANS--CANSORE: This is a scoring system rated by clinical evidences of malnutrition in term babies determined by inspection and hands on estimate of loss of subcutaneous tissue and muscle. This simple, rapid, quantifiable examination is considered a clinical assessment of nutritional status. CANS was developed as a systematized extension of the observations of Mc lean and Usher and Scott and Usher and the system was originally developed by Reba Michels Hills.⁸

Jack Metcoff modified CANS and applied this scoring system on 1382 singleton term babies. According to this score; there are **nine** signs of nutritional status in newborn term infants. Each of the signs is rated from **4** (best, no evidence of malnutrition) to **1**(worst, definite evidence of malnutrition in utero)

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Scores less than or equal to 24 are taken as clinical evidence of malnutrition, which is occurring in utero i.e. Fetal Malnutrition³ In his study, Jack Metcoff observed that 95% of AGA babies had a score greater than 24. More than 54% of SGA babies were malnourished, but 46% SGA babies had a score greater than 24. 5.5% AGA babies were fully grown but were malnourished. A large error in classification would occur if SGA or IUGR were considered synonymous with fetal malnutrition and if all AGA babies were considered adequately nourished.

Rohrer's Ponderal Index is relatively independent of race, sex and gestational age. In a study by Paul Merlob, Ponderal Index <2.3 is considered as impaired fetal growth.⁹ D P Davis, Platts and Pritchard used Ponderal index to determine the state of nutrition at birth and found that in infants showing wasting Ponderal Index was <3 centile and in non wasted infants Ponderal index was > 10th centile. Miller and Hassanein proposed that a full term infant is growth retarded if his PI < 2.2¹⁰. Man Mohan et al defined SGA as those with PI falling short of 10th percentile for their gestational age so in a term infant PI <2.25 should be an indicator of intrauterine undernutrition. 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 25.39% and specificity of 95.23% in the present study.

The study re emphasises the observation of Metcoff that SGA and IUGR are not synonymous with fetal malnutrition and it is a clinical diagnosis, independent of birth weight for gestational age and ethnic groups. 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 equipments¹¹. A larger population would be required to establish the utility of CAN score as a good clinical index for predicting neurodevelopmental outcome in infants with fetal malnutrition

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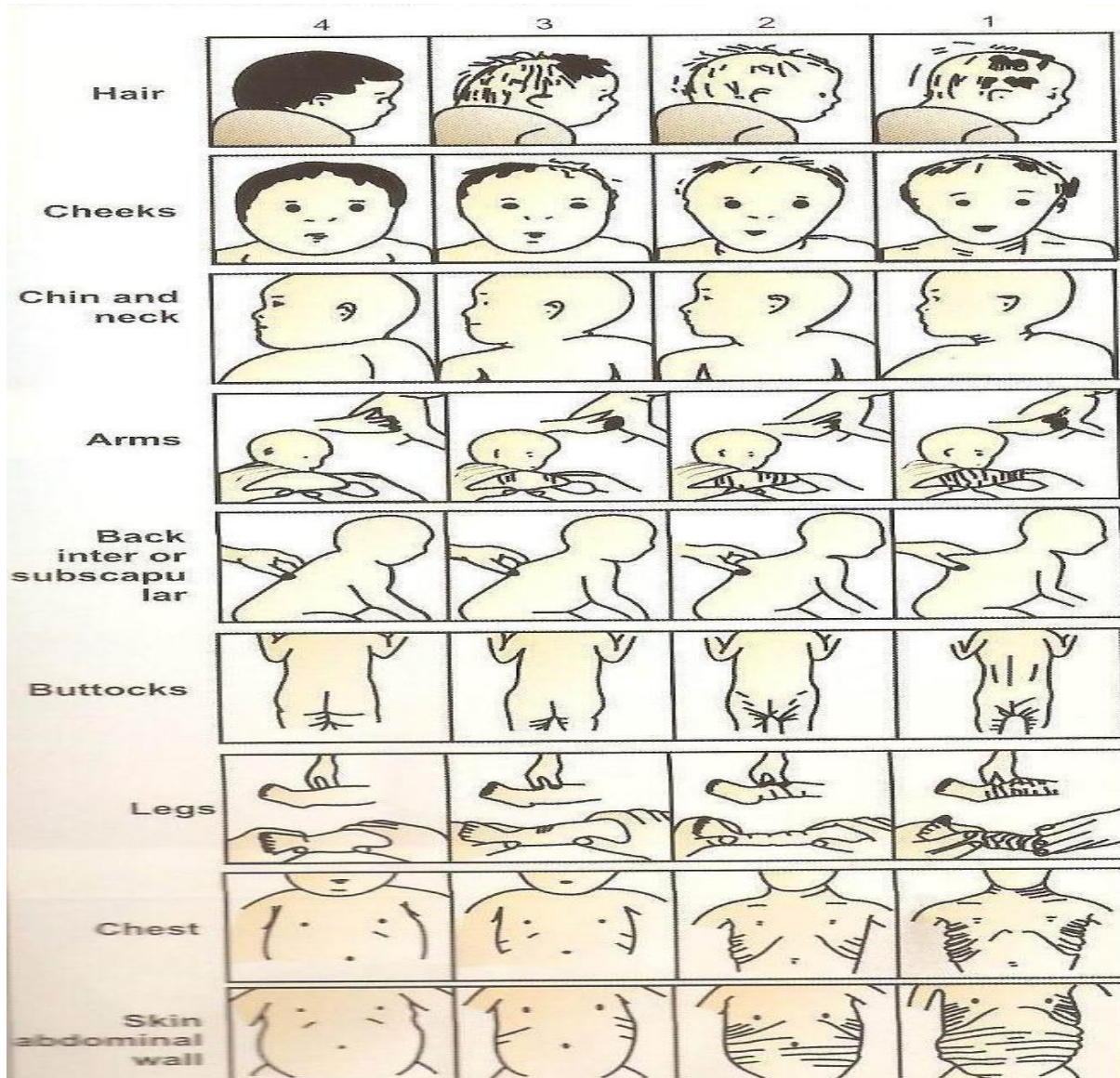


FIG 1 – showing nine signs of CAN score

1. **HAIR** : Large amount, smooth, silky, easily groomed (4) Thinner, some straight, "staring" hair (3) Still thinner, more straight, "staring" hair which does not respond to brushing (2) .Straight "staring" hair with depigmented stripe (flag sign) (1)

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2. **CHEEKS:** Progression from full buccal pads and round face (4), to significantly reduced buccal fat with narrow, flat face (1)
3. **NECK AND CHIN:** Double or triple chin fat fold, neck not evident (4); to thin chin. No fat fold, neck with loose, wrinkled skin, very evident (1).
4. **ARMS:** Full, round, cannot elicit "accordion" folds or lift folds of skin from elbow or triceps area (4); to a striking "accordion" folding of lower arm, elicited when examiner's thumb and fingers of the left hand grasp the arm just below the elbow of the baby and thumb and fingers of the examiners right hand circling the wrist of the baby are moved towards each other; skin is loose and easily grasped and pulled away from the elbow.
5. **LEGS:** Like arms.
6. **BACK:** Difficult to grasp and lift skin in the interscapular area (4); to skin loose, easily lifted in a thin fold from the interscapular area(1).
7. **BUTTOCKS:** Full round gluteal fat pads (4); to virtually no evident gluteal fat and skin of the buttocks and upper posterior high loose and deeply wrinkled (1).
8. **CHEST :** Full, round, ribs not seen (4); to progressively prominence of the ribs with obvious loss of inter-costal tissues (1).
9. **ABDOMEN :** Full, round, no loose skin (4); to distended or scaphoid, but with very loose skin, easily lifted, wrinkled and "accordion" folds demonstrable.