Original Article

Comparative study of CANSCORE with anthropometry in the assessment of fetal malnutrition at tertiary care hospital

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Abstract

There are various methods to determine nutritional status of newborns at birth like weight for gestational age, Body Mass Index (BMI) Ponderal index, mid arm/head circumference ratio, etc., but each has its own drawbacks. Since neonatal morbidity and mortality is more closely related to nutritional status of newborn at birth, a Clinical Assessment of Nutritional status score (CANSCORE) was developed by Metcoff to differentiate malnourished from appropriately nourished babies. This score has been tested and approved by various other authors also. **Objectives: 1.**Detection of fetal malnutrition by Clinical Assessment of Nutritional Status Score (CANSCORE) of term neonates at birth 2. Comparison of CANSCORE with other commonly used anthropometric measures for defining nutritional status of newborn babies **Methods:** Cross-sectional studyof 200 term healthy newborns born in a teaching hospital were assessed using CANSCORE. Complete anthropometric measurements like weight, length, head circumference (HC), mid arm circumference (MAC), mid arm circumference/ head circumference (MAC/HC) ratio and ponderal index (PI) were determined, and compared to CANSCORE. **Results:** with a cut off value 25, CANSCORE identified 74% of the babies as well nourished and 26% as malnourished. Babies were classified as per Weight for age, nearly 71.5% of babies as well nourished and 28.5% as malnourished. MAC/HC ratio classified 69% of babies as well nourished and 31% as malnourished. Also Ponderal Index classified 74.5% the babies as well nourished and 25.5% as malnourished **Conclusion:** CANSCORE is a simple, clinical method for identifying Fetal Malnutrition (FM) in term babies which can even detect malnourished newborns who are missed by other anthropometric methods.

Key Words: CAN score, Fetal malnutrition, Term newborns.

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INTRODUCTION

"Fetal Malnutrition", is a term coined by Scott and Usher.[1] It is a clinical state characterized by obvious intrauterine loss or failure to acquire normal amounts of subcutaneous fat and muscles[1.] The incidence of low birth weight (LBW) babies (< 2500 g) continues to be high in India at about 30% in contrast to 5-7% in developed countries[2]. Most common criteria adapted for defining fetal malnutrition are weight at birth a value <2500 gm is used as cut off. This will miss newborns with malnutrition in late 3rd trimester as their weight may be above 2500 gm.

Clinical assessment of nutritional status, or CANSCORE

is a simple scoring system developed by Jack Metcoff to differentiate malnourished from appropriately nourished babies[3] He described 9 superficial, easily detectable signs of malnutrition in the newborn which includes hair, buccal pad of fat, chin fat which usually obscures the neck in well-nourished babies; skin of arm and legs, intercostals spaces on chest and subcutaneous fat on back, abdomen and buttocks,. These signs score one (worst, severe FM) and four (best, well-nourished). The range of CANSCORE scoring system ratings are 36 (highest) in a well nourished baby and 9 (lowest) in a newborn with

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severe malnutrition. Ponderal index, Body mass Index, mid-arm circumference and mid-arm circumference/ Head circumference ratio are some other measurements used to identify newborn babies with malnutrition.

Nutritional assessment by CANSCORE system

	4	3	2	1
Hair	Thick, dense, smooth, satin-like, easy to comb	Thick, Scarce, there is little hair straight	Thin, straight and put up with more hairs	Sparse, straight and erect, hair bundle associated with reduced pigmentation
Cheek	Plump, round face	Slightly reduced fat	Significantly reduced	Fat is almost gone, narrow face
Neck chin	Fat overlap into double or triple chin, neck covered	Slightly reduced fat chin, the neck can be seen	Fat pad thin chin, neck revealed	Chin fat disappears, the neck is clear, loose skin, wrinkle
Arm	Fullness, cannot lift the skin	Little thin, check on pressure of hands, the accordion-like folds can be formed	Small arm, to form accordion-like folds	Very little fat, loose skin, significant accordion-like folds
Back	Inter-scapular area of skin cannot be picked	Little to lift the skin	Easy to lift the skin	Loose skin, easy to lift wrinkles can form
Buttock	Fat pad thick	Slightly reduced fat	Significantly reduced fat, hips tip wrinkle	Fat disappears, wrinkles, loose skin and a very thin pipe like hip
Leg	Described with the same arm	Described with the same arm	Described with the same arm	Described with the same arm
Chest	Ribs not visible, Intercostal space full	Intercostal space slightly visible	Prominent ribs, intercostals space slightly visible	Prominent ribs, obvious loss of intercostals tissue
Abdomen	Fullness, thick subcutaneous fat	Slightly reduced fat	Wall thinning, can form accordion-like folds	Abdominal bulging/ boat shaped abdomen, looses skin, can form accordion-like folds

Objective of our study was to identify the incidence of fetal malnutrition by CAN score and to compare it with other anthropometric indices.

MATERIAL AND METHODS

This cross- sectional study was conducted in the post natal care ward, Government Medical College and Hospital Latur. 2oo singelton term newborns born during 1st December to 31st December 2015 were studied. Ethical clearance was obtained from Institutional ethical committee prior to start of study.

Inclusion Criteria: live singleton term newborn whose hospital stay exceeded 24 hrs of age were included.

Exclusion Criteria: Preterm babies, babies with congenital anomalies, multiple gestation, born to mothers with gestational diabetes and babies requiring admission to neonatal Intensive care (NICU) were excluded.

- Weight was recorded on an electronic weighing scale at birth with 2 gm accuracy.
- Length, mid arm circumference and head circumference were also recorded with non streaching measuring tape with 0.1 cm accuracy.
- Ponderal index was calculated as weight (grams)/Length^3 (cm) × 100.
- CAN score determined within 24-48 hrs after birth and value < 25 were classified as fetal malnutrition[3].
- PI < 2.2, MAC <8.6, MAC/HC ratio < 0.27 and birth weight <2500 gm were considered as malnutrition[4].
- The observations were Statistically analyzed using IBM SPSS 21.0 version.

RESULTS

Characteristics of babies in our study is shown in table 1. Mean birth weight, length, HC, MAC,MAC/HC ratio, and Ponderal Index were 2.9kg, 48.1cm, 33.7cm, 11.5cm, 0.38, and 3.1 respectively.

Table 1: Characteristics of babies in the study

Characteristics	Range	MEAN ± SD
Birth Weight (gm)	1700-4000	2912.94 (±433.88)
Length (cm)	41-55	48.16 (± 2.46)
Head circumference (cm)	29 -38	33.71 (±1.28)
MAC (cm)	9 -14	11.49 (±0.83)
MAC/HC	0.23 -0.41	0.33 (±0.26)
Ponderal Index	1.68 -4.55	3.11 (±0.58)

MAC-Mid arm circumference; MAC/HC- Mid arm circumference/ Head circumference

Relation between sex and fetal malnutrition is given in table 2. A total of 200 newborns were assessed which

included 112 males and 88 females. The overall incidence of fetal malnutrition was 26% as identified by CAN Score. There was equal sex predisposition in the incidence of fetal malnutrition between male and female newborn babies.

Table 2: Relation between sex and fetal malnutrition

Parameter	Male (%)	Female(%)	Total
Malnourished (CANSCORE ≤25)	28 (25%)	24 (27.27%)	52 (26%)
Well nourished (CANSCORE >25)	84 (75%)	64 (72.73%)	148 (74%)
Total	**112**	**88**	**200 (100%)**

Comparison of validity measurements of CAN Score with different methods is given in Table 3. Ponderal index had low sensitivity of 63 % with 89% specificity, MAC/ HC ratio had sensitivity of 75.3 % and specificity of 91%, Weight category had high specificity of 95% with sensitivity of 84.3%.

Table 3: Comparison of validity measures of different methods with CANSCORE

Validity measures	Birth wt	Ponderal Index	MAC/HC ratio
Sensitivity (%)	84.3	63	75.3
Specificity (%)	95	89	91
Positive predictive value (%)	92	79	82
Negative predictive value (%)	90	84	89

BMI- Body mass index MAC/HC –Mid arm circumference /Head circumference

Distribution of Well nourished and Malnourished by different methods is given in table 4. With a cut off value 25, CANSCORE identified 74% of the babies as well nourished and 26% as malnourished. Weight for age classified nearly 71.5% of babies as well nourished and 28.5% as malnourished. MAC/HC ratio classified 69% of babies as well nourished and 31% as malnourished. Also Ponderal Index classified 74.5% the babies as well nourished and 25.5% as malnourished.

Table 4: Distribution of Well nourished and Malnourished by different methods

Nutritional status	Method							
	CAN score	No. (%)	Birth wt in (gm)	No. (%)	MAC/HC ratio	No. (%)	PI	No. (%)
Malnourished	≤25	52 (26%)	<2500	57 (28.5%)	<0.27	62 (31%)	<2.2	51 (25.5%)
Well nourished	>25	148 (74%)	≥2500	143 (71.5%)	≥0.27	138 (69%)	≥2.2	149 (74.5%)

No.-Number, PI- Ponderal index ; MAC/HC –Mid arm circumference /Head circumference.

DISCUSSION

Several recent studies in literature, namely studies by Abhaykumar Dhanorkar *et al*[5], Sankhyan N *et al*[6], Mahalingam Soundarya *et al*[7], Faheem M *et al* [8,] Vikram Singhal *et al*[9], O. J. Adebami *et al*[10] and Liladhar Kashyap, *et al*[11] all have stressed the usefulness of CANSCORE in detecting fetal malnutrition. In our study 26% fetal malnutrition was identified by CANSCORE. In a recent Indian study, Abhaykumar Dhanorkar *et al*[5] found FM of 32.29% by CANSCORE. In another Study Naveen Sankhyan *et al*[6] diagnosed 27.97% malnourished neonates, Soundarya M *et al*[7] found Incidence of FM to be 24%., whereas Faheem M *et al*[8] detected 24.5% FM. Vikram Singhal *et al*[9] detected FM of 17.5%. whereas Adebami *et al*[10] detected 18.8 % malnutrition by CANSCORE. Higher percentage of FM in some of studies may be explained by low socio economic condition of the mothers. Most of the classification systems for malnourished babies are based on observed birth weight either below or more than or equal to 2500 grams[12-14]. However, none of the above classification system identifies fetal malnutrition, a term coined by Scott and Usher[1], 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 84.3% and specificity of 95%. In Dhanorkar A *et al* study[5], the sensitivity and specificity was 85 % and 97% respectively. Ponderal index has also been used by various authors to classify intrauterine growth retarded infants. Miller and Hassanein[15] 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. In our study, fetal malnutrition by Ponderal index was 25.5% and when CANSCORE was compared with Ponderal index it gave sensitivity of 63% and specificity of 89%. Dhanorkar A *et al* study[5] found that fetal malnutrition by Ponderal index was 24.48% and sensitivity and specificity of CANSCORE was 61% and 93.08% respectively. Meadow and colleagues[16] 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. In our study fetal malnutrition by MAC/HC (<0.27) was 31%. CANSCORE gave Sensitivity and specificity of 75% and 91% with MAC/HC ratio. In Dhanorkar A *et al*.[5] study sensitivity and specificity was 76% and 92% respectively. And in Soundarya M *et al*. study[7] the sensitivity and specificity was 41.6% and 77.6% respectively.

CONCLUSION AND RECOMMENDATION

- The present method of classifying babies on basis of weight may miss to diagnose some of the cases of malnutrition who are affected very late in third trimester.
- CAN Score is a simple systematic method to identify fetal malnutrition.
- It does not require any sophisticated equipments or time consuming calculations.
- The main area of application of this tool is in periphery where availability of qualified personnel is less.

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