ORIGINAL ARTICLE

CANSCORE- IMPORTANT INDEX FOR DETECTION OF FETAL MALNUTRITION AT BIRTH

Ajay Sethi[1], Devang D Gandhi[1], Shradha H Patel[2], Darshan K Presswala[2], Shefali B Patel[2]

Author's Affiliations: [1]Assistant Professor, [2]Resident, Dept. of Pediatrics, SMIMER, Surat, Gujarat
Correspondence: Dr. Ajay Sethi E-mail: divyamsethi91@yahoo.co.in

ABSTRACT

Introduction: Malnutrition refers to the situation where there is an unbalanced diet in which some nutrients are in excess, lacking or wrong proportion. Simply put, we can categorise it to be under-nutrition and over-nutrition. Despite India's 50% increase in GDP since 1991,[3] more than one third of the world's malnourished children live in India. The present study was conducted to assess utility of CANSCORE and it compared with other commonly used measures for defining the nutritional status at birth.

Methodology: The current study was conducted by the department of Paediatrics, S.M.S. Medical College, Jaipur. All neonates delivered at Mahila and Zenana Hospital, S.M.S. Medical College, Jaipur. All neonates delivered at the hospital and fulfilling inclusion criteria during one year period were included in the study. Different indices to measure nutritional status of newborns like Birth weight to Gestational Age, Ponderal Index, Mid Arm Circumference/ Head Circumference Ratio and CANSCORE were calculated. Clinical Assessment of Nutrition Score (CANSCORE)- is done within 48 hours on the basis of superficial readily detectable signs of malnutrition in the newborn as described by Metcoff.

Results: According to Birth weight to Gestational Age criteria, 116 (23.2%) newborns were malnourished (Small for Gestational Age). According to Ponderal Index, 120 (24%) newborns were malnourished (PI < 2.2). According to Mid Arm Circumference/ Head Circumference Ratio criteria, 205 (41%) newborns were malnourished (MAC/HC < 0.27). According to CANSCORE, 177 (35.4%) newborns were malnourished (CANSCORE < 25). It was observed that out of total 116 newborns diagnosed with malnutrition by Birth weight to Gestational Age index, only 81 (69.8%) were also diagnosed with malnutrition by CANSCORE. Out of total 120 newborns diagnosed with malnutrition by Ponderal index, only 73 (60.8%) were also diagnosed with malnutrition by CANSCORE. Out of total 205 newborns diagnosed with malnutrition by Mid Arm Circumference/ Head Circumference Ratio index, only 127 (61.9%) were also diagnosed with malnutrition by CANSCORE.

Keywords: Malnutrition, CANSCORE, Ponderal Index, Mid Arm Circumference/ Head Circumference Ratio

INTRODUCTION

The 2015 Global Hunger Index (GHI) Report ranked India 20th amongst leading countries with a serious hunger situation. Amongst South Asian nations, it ranks third behind only Afghanistan and Pakistan with a GHI score of 29.0 ("serious situation").[1] India is one of the fastest growing countries in terms of population and economics, sitting at a population of 1.2 billion and growing at 1.5%–1.7% annually (from 2001–2007).[2] India's Gross Domestic Product growth was 9.0% from 2007 to 2008; since Independence in 1947, its economic status has been classified as a low-income country with majority of the population at or below the poverty line.

Though most of the population is still living below the National Poverty Line, its economic growth indicates new opportunities and a movement towards increase in the prevalence of chronic diseases which is observed in at high rates in developed countries such as United States, Canada and Australia. The combination of people living in poverty and the recent economic growth of India has led to the co-emergence of two types of malnutrition: undernutrition and overnutrition.

Malnutrition refers to the situation where there is an unbalanced diet in which some nutrients are in excess, lacking or wrong proportion. Simply put, we can categorise it to be under-nutrition and over-nutrition. Despite India's 50% increase in GDP since 1991,[3]

more than one third of the world's malnourished children live in India. Among these, half of them under 3 are underweight and a third of wealthiest children are over-nutriented.[4]

Recently, the nutritional status of newborn assessing using Clinical Assessment of Nutrition Score (CANSCORE)- a simple, clinically applicable scoring system devised by Metcoff[5] as a systematized extension of observation of McLean & Usher[6] and Scott & Usher[7], nine superficial readily detected signs of malnutrition in newborns. The present study was conducted to assess utility of CANSCORE and it compared with other commonly used measures for defining the nutritional status at birth.

METHODOLOGY

Study setting: The current study was conducted by the department of Paediatrics, S.M.S. Medical College, Jaipur.

Study Population: All neonates delivered at Mahila and Zenana Hospital, S.M.S. Medical College, Jaipur.

Study Participants: All neonates delivered at the hospital and fulfilling inclusion criteria during one year period were included in the study.

Inclusion Criteria: Neonates fulfilling all below criteria were included in the study

1. Live born, singleton infants
2. Only infants whose hospital stay exceeded 24 hours of age.
3. Known gestational age (last menstrual period or Ballard score)
4. No major congenital malformation.
5. Parents willing to give informed written consent to participate in the study.

Anthropometric measurements like Length, weight, Mid arm circumference and Head Circumference were measured at the time of birth. All circumferences were measured by standard technique using a metallic tape nearest to 0.1 cm. Length was measured using infantometer. Weight was measured to the nearest 0.05 kg using infant weighing scale. All measurements were recorded on Performa with other basic details of neonates.

Different indices to measure nutritional status of newborns like Birth weight to Gestational Age, Ponderal Index, Mid Arm Circumference/ Head Circumference Ratio and CANSCORE were calculated.

Clinical Assessment of Nutrition Score (CANSCORE)- is done within 48 hours on the basis of superficial readily detectable signs of malnutrition in the newborn as described by Metcoff.[5]

Nine signs for clinical assessment of nutritional status in newborn (CANSCORE)

1. Hair: Large amount, smooth silky, easily groomed (4). Thinner, some straight 'staring' hair (3). Still thinner, more straight, 'staring' hair which doesn't respond to brushing (2).
2. Cheeks: progression from full buccal pads and round face (4), to significantly reduced buccal fat, with narrow, flat face (1).
3. Neck & 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 lifts folds of skin from elbow or tricep 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 examiner 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 (1).
5. Legs: Like arms.
6. Back: different to grasp and left 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 found ribs not seen (4); to progressively prominence of the ribs with obvious loss of intercostal tissue (1).
9. Abdomen: full, round, no loose skin (4), to distended or scaphoid, but very loose skin, easily lifted, wrinkled and 'accordion' folds demonstrable.

The CANSCORE ratings were 36 highest and 9 lowest. The newborn babies were distributed according to CANSCORE and CANSCORE below 25 was considered a clinical criteria for malnourished babies.

The malnutrition was also assessed by other criteria e.g. Ponderal Index, weight for gestational age; MAC/HC ratio and data obtained was compared with that of CANSCORE.

Permission of Institutional Ethical Committer was obtained before study. All parents of eligible neonates were explained the nature of study and asked for written consent. All data were entered in to Microsoft Excel and analysed.

RESULTS

There were total 500 neonates included in the study during the study period of one year. Out of total 500 neonates, 313 (62.6%) neonates were male and 187 (48.4%) neonates were female. Mean length of newborns was 46.7 cm. Mean of birth weight of all newborns was 2.59 kg. Around 35% of infants were having birth weight of less than 2.5 kg which are considered Low Birth Weight babies. Maximum number of newborns i.e. 220 (44%) were having birth weight of 2.5 to 3.0 kg. 17.8% of newborns were having birth weight of 3.0 to 3.5 kg.

Table 1: Distribution of Newborns in well-nourished and Malnourished by different indices (N=500)

Indices	Well Nourished (%)	Malnourished (%)
Birth weight to Gestational Age	384 (76.8)	116 (23.2)
Ponderal Index	380 (76.0)	120 (24.0)
MAC/ HC	295 (59.0)	205 (41.0)
CANSCORE	323 (64.6)	177 (35.4)

MAC/HC: Mid Arm Circumference/ Head Circumference Ratio

Table 1 shows distribution of study population as well nourished and malnourished according to different methods in general.

According to Birth weight to Gestational Age criteria, 116 (23.2%) newborns were malnourished (Small for Gestational Age). According to Ponderal Index, 120 (24%) newborns were malnourished (PI < 2.2). According to Mid Arm Circumference/ Head Circumference Ratio criteria, 205 (41%) newborns were malnourished (MAC/HC < 0.27). According to CANSCORE, 177 (35.4%) newborns were malnourished (CANSCORE < 25).

Table shows relation of CONSCORE index with other indices in terms of diagnosis of malnutrition.

It was observed that out of total 116 newborns diagnosed with malnutrition by Birth weight to Gestational Age index, only 81 (69.8%) were also diagnosed with malnutrition by CANSCORE.

Out of total 120 newborns diagnosed with malnutrition by Ponderal index, only 73 (60.8%) were also diagnosed with malnutrition by CANSCORE.

Table 2: Relation of CANSCORE with other indices

Group	CANSCORE >=25 (%)	CANSCORE <25 (%)	Total
Birth weight to Gestational Age			
AGA	288 (75.0)	96 (25.0)	384
SGA	35 (30.2)	81 (69.8)	116
Ponderal Index			
PI >=2.2	276 (72.6)	104 (27.4)	380
PI <2.2	47 (39.2)	73 (60.8)	120
Mid Arm Circumference/ Head Circumference Ratio			
MAC/HC > 0.27	245 (83.0)	50 (17.0)	295
MAC/HC < 0.27	78 (38.1)	127 (61.9)	205

Out of total 205 newborns diagnosed with malnutrition by Mid Arm Circumference/ Head Circumference Ratio index, only 127 (61.9%) were also diagnosed with malnutrition by CANSCORE.

Table 3: Kappa agreement between CANSCORE and other indices

Indices	Kappa Value	Interpretation Agreement
Birth weight to Gestational Age	0.38	Fair
Ponderal Index	0.30	Fair
MAC/ HC	0.45	Moderate

Table shows Kappa agreement of different indices with CANSCORE. Kappa agreement value for Birth weight to Gestational Age index with CANSCORE was 0.38. This shows Fair Agreement between between these two indices.

Kappa agreement value for Ponderal index with CANSCORE was 0.30. This shows Fair Agreement between these two indices.

Kappa agreement value for Mid Arm Circumference/ Head Circumference Ratio index with CANSCORE was 0.45. This shows Moderate Agreement between these two indices.

DISCUSSION

The present study was conducted by the department of Paediatrics, SMS Medical College, Jaipur on 500 live borns delivered at Mahila and Zenana Hospital. The malnutrition among newborns was also assessed by other criteria e.g. Ponderal Index, weight for gestational age; MAC/HC ratio and data obtained was compared with that of CANSCORE.

CANSCORE was introduced by Metcoff[5] for the clinical assessment of fetal malnutrition, he found it too simple, rapid and quantifiable examination. Mehta et al[8] evaluated the suitability of CANSCORE for the assessment of fetal malnutrition. They inferred that CANSCORE is simple clinical index for identifying fetal malnutrition and may have the potential to predict neonatal morbidity associated with it without the aid of sophisticated instruments.

When the malnourished and well nourished babies diagnosed by CANSCORE and birth weight to gestational age criteria were compared, it was found that out of 500 newborns, 384 (76.8%) were appropriate for gestational age (AGA) and 116 (23.2%) newborns were small for gestational age (SGA). Out of 384 (76.8%) AGA newborns, 96 (54.2%) were malnourished by CANSCORE criteria, and out of SGA newborns, 35 (10.8%) babies were well nourished by CANSCORE criteria.

Out of 500 newborns, 323 (64.6%) were well nourished and 177 (35.4%) were malnourished by CANSCORE criteria. Out of 177 (35.4%) malnourished babies, 96 (54.2%) babies were AGA. Out of 323 (64.6%) well-nourished babies, 35 (30.17%) were SGA.

If AGA was considered as well nourished and SGA as malnourished, than 25% of AGA babies were misdiagnosed as well nourished and 30.17% of SGA were misdiagnosed as malnourished in relation to CANSCORE criteria. Further, Kappa Agreement Value between CANSCORE and Birth weight to Gestational Age was 0.38 showing only Fair agreement between these two indices. This observations suggest that AGA babies, may be malnourished and SGA babies may be well nourished. Therefore, birth weight to GA criteria is not suitable for assessing malnutrition.

When present study was compared with Metcoff study, the percentage of malnourished babies in present study was 35.4% in comparison to 10.9% in Metcoff study.[5] Probable reason for high incidence of malnourished babies in present study may be poor economic status, poor antenatal care, poor nutrition of mother during last trimester, underweight and short stature mothers. In study by Mehta et al, it was found that out of 637 malnourished newborns diagnosed by Birth weight to Gestational Age criteria, 382 (60%) were well nourished by CANSCORE criteria.[8] The result of our study were almost similar to the study by Mehta et al.

Comparison between well nourished and malnourished babies diagnosed by CANSCORE and Ponderal Index (PI) was done. It was found that out of 500 newborns, 380 (76%) babies were well nourished by PI criteria (PI > 2.2) and 120 (24%) babies were malnourished by PI criteria (PI<2.2). Out of 380 (76%) babies with PI<2.2, 47 (39.25) were well nourished by CANSCORE criteria. Out of 500 newborns, 323 (64.6%) babies were well nourished and 177 (35.4%) were malnourished by CANSCORE criteria, out of 177 (35.4%) newborns, 104 (58%) babies had PI<2.2. Thus if PI is considered, 27.4% with PI> 2.2 were misdiagnosed as well nourished and 39.2% of babies with PI < 2.2 were misdiagnosed as malnourished. Kappa agreement value between CANSCORE and PI was also 0.30 suggesting only fair agreement between two indices. These observations suggest PI criteria does not identify fetal malnutrition adequately. Similarly from tables, it was observed that MAC/HC criteria also not identify fetal malnutrition adequately.

The observations by Metcoff and Mehta et al that SGA and IUGR are not synonymous with fetal malnutrition and it is a clinical diagnosis independent of birth weight for gestational age and ethinic groups is being re-emphasized by the present study. Since CANSCORE is simple, clinical index for identifying fetal malnutrition and may have the potential to predict morbidity associated with it without the aid of sophisticated equipment, it can be advantageous to use such a score in a developing country like India.

REFERENCES

1. Global Hunger Index Report 2015. Available at: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/129681/filename/129892.pdf#page=21 Last accessed on 21 June, 2016.
2. Malnutrition in India. Available at: https://en.wikipedia.org/wiki /Malnutrition_in_India. Last accessed on 21 June, 2016.
3. The Indian exception. Available at: http://www.economist.com/node/18485871. Last accessed on 21 June, 2016.
4. Putting the smallest first. Available at: http://www. economist .com/node/17090948. Last accessed on 21 June, 2016.
5. Metcoff J. Clinical assessment of nutritional status at birth. Fetal malnutrition and SGA are not synonymous. Pediatr CLin North AM 1994; 41:875-891
6. McLean F, Usher R. Measurements of live born fetal malnutrition infants compared with similar gestation and similar birth weight controls. Bio Neonate 1970; 16:215-216.
7. Scott KK, Usher RH. Fetal Malnutrition: its incidence causes and effects, Am J Obstet Gynaecol 1966; 94:951-963.
8. Mehta S, Tondon A, Dua T, Kumari S, Singh SK. Clinical assessment of nutritional status at birth. Indian Pediar 1998; 35:432-428.