VOLUME-8, ISSUE-1, JANUARY-2019 • PRINT ISSN No 2277 - 8160

Original Research Paper

Paediatrics

CAN SCORE VERSUS OTHER ANTHROPOMETRIC INDICES TO ASSESS NUTRITIONAL STATUS IN NEW-BORNS

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ABSTRACT

Background: Foetal malnutrition is one of the common cause of morbidity and mortality in neonates in a developing country like India and needs to be identified at birth.

Objective: To assess foetal nutrition using CAN score and to compare it with other anthropometric indices.

Methods: Prospective observational study consisting of 500 singleton full term neonates, assessed for foetal malnutrition using CAN score and then compared with other methods like Ponderal Index, MAC/OFC ratio and Weight for gestational age.

Results CAN score identified 66.4% babies as malnourished whereas Ponderal index identified 51.2% followed by MAC/OFC ratio as 45.6% babies. 62.8% babies were AGA and 37.2% babies were SGA according to weight for gestational age.

Conclusion CAN scoring system is a simple method of identifying foetal malnutrition which can be missed by other methods.

KEYWORDS : Foetal Malnutrition, CAN score, Ponderal Index, Kanawati Index.

INTRODUCTION

In India, the incidence of low birth weight (LBW) babies is as high as 20% in contrast to 7% in the developed countries.[1] Moreover some new-borns develop malnutrition in late third trimester and may have a birth weight of above 2.5 kg. These babies get misdiagnosed as normal despite being malnourished. It is important to address this hidden problem of foetal malnutrition because of the potentially serious sequelae of malnutrition on multiple organ systems. Studies have shown that 39% of malnourished babies had intellectual and neurological sequelae.[2] Currently commonly used methods of classifying babies are based on weight for gestational age; accordingly babies are classified into AGA,SGA & LGA. But the overall nutritional status of babies cannot be assessed by this hence it is necessary to classify infants with/without malnutrition in addition to AGA or SGA. There are other anthropometric indices such as Ponderal Index (PI), Mid-upper arm circumference(MAC) to occipitofrontal (OFC) ratio also known as 'Kanawati Index' which help in assessing the nutritional status of the new-borns.[3] Clinical Assessment of Nutrition Status (CAN) score is a method to identify babies on the basis of clinical features as well-nourished or malnourished. [3,4] This method can help in differentiation of new-borns who are malnourished and early intervention helps in preventing the morbidity and mortality of such infants. Hence, we took up this study to compare CAN score with other commonly used anthropometric indices such as Ponderal Index, MAC/OFC ratio and Weight for gestational age for assessing foetal malnutrition in new-borns.

SUBJECTS AND METHOD

This study was a prospective observational study undertaken in the PNC ward of a tertiary care hospital. Approval of institutional ethics committee was taken prior to initiating the study. A total of 500 of single live born term infant with gestational age of > 37 weeks having hospital stay of more than 24hrs were taken in the study after taking an informed consent from the parents. Babies with gestational age of <37wks, high risk babies, babies with congenital malformations and babies admitted in NICU were excluded from the study.

Data was entered in a pre-structured proforma. Weight was recorded at birth on an electronic scale. The length, head circumference & mid-arm circumference were also recorded between 24-48hrs of birth. Initial 50 assessments were done by 2 observers to find out limitation which can occur due to variation of score between observers and then single observer assessed rest of the measurements. Ponderal index was calculated using the formula: PI = Weight (in grams)/Length^3 (in cm) x 100. A PI <2.2 & MAC/OFC ratio <0.27 was considered as malnutrition.3 CAN Score is a method of clinically assessing the nutritional status of the baby at birth, consisting of nine parameters, which is rated from 1(severe foetal malnutrition) to 4 (well-nourished) as elicited in Table 1.[4] A CAN Score of < 25 was taken to define malnutrition and ≥25 was taken as well nourished. CAN score was then compared to the anthropometric indices to determine the status of nutrition in the new-born.

Observations were statistically analysed on Minitab version 17 with Chi-Square test. P value <0.05 considered statistically significant. Sensitivity, specificity, positive and negative predictive values were also calculated.

Table 1. The Nine Signs for CAN Status in the Newborn4

Physical Signs	Scoring			
	4	3	2	1
Hair	Large amount, smooth, silky, easily groomed	Thinner, some straight, "staring" hair	Less abundant, coarse, straight, and does not respond to brushing	Less abundant or thin, flag sign
Cheeks	Round, large, fat pad	Slightly reduced fat pad	Significantly reduced	Reduced buccal fat with narrow flat face
Neck and Chin	Double or triple neck fat rolls, neck not visible	Full, submandibular fat, moderate neck fat with no rolls	No double chin, some submandibular fat, minimal neck fat	No submandibular fat, thin chin, neck with loose, wrinkled skin very evident
Arms	Upper and lower arm skin thick, subcutaneous tissue taught, cannot pick up over elbow or triceps area	Moderate subcutaneous tissue present on upper and lower arms, slight pleating of skin, cannot pick up over elbow and back of hand	Some subcutaneous tissue present on upper and lower arms, skin loose, pleats easily, can pick up over elbow but not on back of the hand and forearm	Very little fat, loose skin, accordionlike folds significantly
Legs	Thick subcutaneous tissue that cannot be picked up	Some subcutaneous tissue, can pick up easily but good turgor	Skin upper medial thigh loose, easily picked up over anterior thigh but not over tibia	Thighs appear wasted, obvious loose skin, easily picked and pleats, very poor turgor
Back	Upper and lower back subcutaneous tissue thick. Inter-scapular area of skin cannot be picked	Moderate subcutaneous tissue, skin loose over scapular	Some subcutaneous tissue present, skin loose over scapular and lower back	Subcutaneous tissue minimal, skin very loose in appearance, easily tents over scapula, spine, and lower back
Buttocks	Fat pad thickness Round, full and firm	Round, less full, less firm	Flat but definite fat present	Flat, appear wasted, little or no fat
Chest	Round, ribs not seen	Intercostal spaces less prominent, ribs less obvious	Intercostal space revealed	Intercostal space very clear, obvious loss of subcutaneous tissue
Abdomen	Full, round, no loose skin	Round with loose skin, not easily lifted, with no wrinkle	Scaphoid but not very loose, skin easily lifted and with some wrinkles	Distended or scaphoid; but with very loose skin, easily lifted and wrinkled

RESULTS

In this study, a total of 500 new-borns were enrolled and assessed for foetal malnutrition and then classified using CAN score, Ponderal

Index, Kanawati index and weight for gestational age.

Table 2. Distribution of well nourished (WN) and malnourished (MN) by different methods

Category	CAN Score		Ponderal Index		MAC/OFC ratio (Kanawati Index)		Weight For Gestational Age	
Malnourished	332	66.40%	256	51.20%	228	45.60%	186	37.20%
Well nourished	168	33.60%	244	48.80%	272	54.40%	314	62.80%

According to the CAN score, 66.4% babies were found to be malnourished and 33.60% babies were well nourished. Whereas Ponderal index and Kanawati Index identified 51.2% and 45.6% babies as malnourished respectively. With regards to weight for gestational age, 62.8% babies were appropriate for gestational age and 37.2% babies were small for gestational age (Table 2).

Table 3. Distribution and Comparison between Anthropometric indices and CAN Score.

Indices	CAN Score		Total	P value
	Malnourished < 25	Normal ≥25		
Ponderal Index < 2.2 (Malnourished) ≥ 2.2 (Well nourished)	187(73.00%) 145 (59.40%)	69(27.00%) 99 (40.60%)	256 (51.20%) 244 (48.80%)	0.001
MAC/OFC < 0.27 (Malnourished) ≥ 0.27 (Well nourished)	211 (77.60%) 121 (53.10%)	61 (22.40%) 107 (46.90%)	272 (45.60%) 228 (54.40%)	0.0001
Weight for Gestational Age SGA AGA	92 (49.50%) 240 (76.40%)	94 (50.50%) 74 (23.60%)	186 (37.20%) 314 (62.80%)	0.0001

In Table 3, CAN score was applied to other indices i.e., Ponderal Index, Kanawati Index and Weight for gestational age. Out of the 244 new-borns diagnosed as well-nourished by Ponderal index CAN score identified 59.4% babies to be malnourished. There was a statistically significant difference between neonates classified as malnourished using CAN score and Ponderal Index as the p-value was 0.001 (<0.05).

Also when CAN score was compared to Kanawati Index, 53.1 % of babies were found to malnourished using CAN score amongst the well-nourished. The p-value of p = 0.0001 was statistically significant.

Weight for gestational age identified 314 babies as AGA. 76.40% out of 314 had foetal malnutrition after being assessed using CAN score. Amongst SGA babies almost half were identified as well nourished. CAN score identified more number of foetal malnutrition babies, which is statistically significant (p = 0.0001).

DISCUSSION

Assessment of nutritional status of foetus is a major concern to many clinicians because of the potential serious sequelae of malnutrition. At present, commonly used methods of classifying infants are based on weight for gestational age. Accordingly, infants are classified into appropriate for gestational age (AGA), small for gestational age (SGA) and large for gestational age (LGA). This does not indicate the overall nutritional status of the baby.[5]

Foetal malnutrition can occur even in infants with appropriate for gestational age and foetal malnutrition may not be present in infants who are small for gestational age.[4]

Foetal malnutrition was a concept developed by Clifford in 1954 and defined by Scott and Usher, as a clinical state characterised by obvious intrauterine loss or failure to acquire normal amount of subcutaneous fat and muscle.[6] Foetal malnutrition can be present at any birth weight. CAN Score is based on nine superficial detectable signs of malnutrition in the new-born as described by Metcoff J. in which a score of ≤24 is used to define malnutrition (Table 1). CAN Score helps to classify babies based on nutritional status as malnourished or well-nourished babies, so that malnourished infants can be given special care.

In our study, CAN score categorised 66.40% babies as malnourished and only 33.60% babies were categorised as well-nourished. Mean CAN score in our study was 22.7 ± 3.07. In a similar study by Amarendra et al (2017) using CAN score, 68.4% of babies were categorised as malnourished which was comparable to our study.[7] According to another study by Mehta, 40% had fetal malnutrition.[8] Whereas study by Almarzoki Jasim (2015), detected only 31.03% of babies as malnourished. The difference between our study and Almarzoki Jasim et al can be explained by the fact that later study was conducted in developed country where prevalence of malnutrition is lesser than in a developing country.[9]

Ponderal index, another entity for assessing the nutritional status, categorized, 51.20% (256) of babies as malnourished. A study by Waghmare and Amarendra et al (2017) identified 40.8% and 61.6 % of babies as malnourished respectively.[7,10] Whereas, Almarzoki Jasim (2015) categorised only 21.18 % of babies as malnourished by Ponderal Index.[9] When CAN score was applied to these 244 well-nourished babies, CAN score could identify 59.4% of babies to be malnourished. A P-value between the two parameters was <0.001 which is statistically significant suggesting that CAN score is better in detecting foetal malnutrition.

Ponderal index if less than 2.2 categorises babies as malnourished. Ponderal index relies on the principal that the length is spared at expense of weight during acute malnutrition, however it does not take into account chronic malnutrition where both length and weight is affected with their ratio being normal. This leads to misdiagnosing of malnourished babies as normal. CAN score is simpler to learn and easy to do with the help of illustrations of the signs and score described by Metcoff.[4] It doesn't require any measuring instruments.

In this study 45.6 % of babies were categorised as malnourished by Kanawati Index out of 500 babies. Various Indian studies detected 40% -56% (Mehta, Amarendra) babies as malnourished which was similar to our study.[7,8] When CAN score was applied to babies who were categorized as well-nourished by Kanawati Index, 53.1% babies were found to be malnourished. P value being <0.00001 which is significant. Meadow and colleagues concluded that the MAC/HC ratio, independent of birth weight, readily discriminated the late gestation growth retarded baby. This ratio can be used as a test to identify neonates whose growth is retarded, even when their weight does not fall below 10th percentile. But those babies whose head circumference is reduced because of proportionate growth retardation might not be identified by MAC/OFC ratio and the malnourished babies will be missed. CAN score overcomes this issue by detecting the malnourished babies independent of the head circumference and without taking any measurement.[11]

In the present study out of 500 babies , 314 (62.8%) babies were appropriate for gestational age(AGA) and 186 (37.2%) babies were small for gestational age (SGA)by using weight for gestational age. On applying CAN score to these SGA babies, nearly half of them were identified as malnourished out of 186 total SGA babies. Similarly on applying CAN score on AGA 314 babies, 76.4% of babies were identified as malnourished. In study by Liladhar et al, 27.4% babies were malnourished by the application of SGA and 63% were measured as malnourished of the total AGA.[12] The diagnosis of small

for gestational age is usually based on the use of pre-determined intrauterine growth chart. SGA new-borns are those who are smaller in size than normal for gestational age and defined as a weight below the 10th percentile for the gestational age. It is therefore unlikely to be sensitive, in identifying or describing infants with wasting or foetal malnutrition. This is particularly true if local standards are not used because average birth weight falls above the 10th percentile on a chart constructed for a particular community and it may fall below the 10th percentile in another chart constructed for a different population. CAN score which is independent of intrauterine growth charts should therefore be preferred.

CONCLUSION

CANSCORE scoring system is a simple method of identifying foetal malnutrition. Using this method, assessment of foetal malnutrition can be done in all term babies irrespective of their birth weight. This method does not require any sophisticated equipment or laborious calculation. It should be used as a routine method of assessing nutritional status in labour ward and neonatal centre, so that we can readily pickup all malnourished babies at earliest and ensure timely intervention.

REFERENCES

1. P. Bharati, M. Pal, M. Bandyopadhyay, A. Bhakta, S. Chakraborty, and P. Bharati, "Prevalence and causes of low birth weight in India," Malaysian Journal of Nutrition, vol. 17, no. 3, pp. 45–56, 2011.
2. Adebami OJ, Owa JA, Oyedeji GA, et al. Prevalence and problems of foetal malnutrition in term babies at Wesley Guild Hospital, South Western Nigeria. West Afr J Med. 2007;26(4):278–82.
3. World Health Organization. The newborn infant. WHO Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee. WHO Technical Report Series. 1995;854:121–58.
4. Metcoff J. Clinical assessment of nutritional status at birth. Fetal malnutrition and SGA are not synonymous. Pediatr Clin North Am 1994;41(5):875-91.Metcoff J. Clinical assessment of nutritional status at birth. Fetal malnutrition and SGA are not synonymous. Pediatr Clin North Am 1994;41(5):875-91.
5. Kumari S, Jain S, Sethi GR, Yadav M, Saili A, Lal UB. A simple method of screening for intrauterine growth retardation. Indian J Pediatr 1988;55:283-6.
6. Clifford SG. Post-maturity with placental dysfunction: Clinical syndrome and pathologic findings. J Pediatrics 1954;44:1-2.
7. Amarendra, M.; Yoganand, M.. Comparison of clinical assessment of nutritional status (CAN) score with other methods in the assessment of fetal malnutrition. International Journal of Contemporary Pediatrics, [S.l.], v. 4, n. 3, p. 713-718, apr. 2017. ISSN 2349-3291.
8. Mehta S, Tandon A, Dua T, Kumari S, Singh SK. Clinical assessment of nutritional status at birth. Indian Pediatr. 1998;35:423–8.
9. Almarzoki JM, Rana DJ. Comparative study between Clinical Assessment of Nutritional status score (CAN Score) and Anthropometry in the assessment of Fetal malnutrition. Int Res J Med Sci. 2015;3(7):8–12
10. Waghmare P, Balpande N D, Lakhkar B B. Assessment of Fetal Malnutrition By CAN Score. Pediatric Oncall Journal 9(1). doi: 10.7199/ped.oncall.2012.1
11. Meadow NJ, Till J, Leaf A. Screening for intrauterine growth retardation using ratio of midarm circumference to occipitofrontal circumference. Br Med J 1986; 292:1039-1040.
12. Kashyap L, Dwivedi R. Detection of Fetal Malnutrition by Clinical Assessment of Nutritional Status Score (CAN Score) at Birth and Its Comparison with other Methods of Determining Intrauterine Growth. Pediatric Oncall Journal 3(1)