



DETECTION OF FETAL MALNUTRITION BY CLINICAL ASSESSMENT OF NUTRITIONAL STATUS SCORE AT BIRTH AND COMPARING WITH WEIGHT FOR GESTATION AND PONDERAL INDEX.

Dr. S. Madhu*

MD Pediatrics, Senior Civil Surgeon, Government District Headquarters hospital, Krishnagiri. *Corresponding Author

ABSTRACT

Introduction: Fetal malnutrition and the terms 'small for gestational age' (SGA) and 'intrauterine growth retardation' (IUGR) are not alike, one may happen without the other. Fetal malnutrition can be clinically measured by using the Clinical Assessment of Nutritional Status (CAN) score. CAN score can estimate the occurrence of Fetal malnutrition among term newborns and is comparable to anthropometric criteria routinely used to assess fetal growth.

Methodology: A prospective cohort study was carried out at a tertiary care hospital consisting of 100 full-term neonates over a period of three months. Newborns were classified into SGA and appropriate for gestational age (AGA) based on Alexander growth curve. Fetal malnutrition was assessed using CAN score as a standard and compared with weight for gestation age and Ponderal index (PI)

Results: CAN score identified 16% (n = 16) malnourished neonates and 84% (n = 84) of babies as well-nourished by keeping the cut-off value of <25. 10 percent of AGA babies and 70% of SGA babies were found to be well-nourished on comparing weight for gestation age with CAN score. Nine babies were found to have FM using PI but by applying CAN score only 4 babies were found to have FM. The sensitivity and specificity of weight for gestational age were found to 94.12.% and 64.29%, respectively and that of PI 25% and 94%, respectively, when CAN score was taken as standard.

Conclusion: This suggests that CAN score can recognize fetal malnourishment in those neonates, which are missed by other methods.

KEYWORDS : CAN, Anthropometry, Fetal Malnutrition**INTRODUCTION:**

Fetal growth is dependent on the growth potential of the fetus, the availability of intrauterine nutrition and placental function. The efficiency of these factors is birth size at any given gestational age and a wide variation in the state of nutrition at birth. The concept of fetal malnutrition (FM) was initially developed by Clifford¹ and was defined by Scott and Usher² as a clinical state of infants characterized by obvious intrauterine loss of failure to acquire normal amount of subcutaneous fat and muscle. FM and the terms 'small for gestational age' (SGA) and 'intrauterine growth retardation' (IUGR) are not synonymous, one may occur without the other.

Fetal malnutrition can be clinically evaluated by using the Clinical Assessment of Nutritional Status (CAN) score.³ There are various other methods, which are used to determine nutritional status of newborns at birth like weight for gestational age, Ponderal index (PI) and mid arm/head circumference ratio. But each has its own limitations. Detection of fetal malnutrition at birth is thus useful for recognizing those infants who are at more risk for complications associated with abnormal fetal growth. The aim of this study was detection of fetal malnutrition by CAN score of term neonates at birth and its comparison with other methods of determining intrauterine growth.

MATERIALS AND METHODS:

A prospective cross-sectional study was carried out at a tertiary care hospital after taking the prior approval of the Institutional Ethics Committee. 100 full-term neonates were enrolled in the study after taking informed consent from the parents. Neonates (both sexes), born as a result of multiple pregnancies and/or having major congenital malformations were excluded. The study was done for a period of 3 months.

Neonatal anthropometry measurements were carried out between 24-48 hours of newborn age using standard guidelines and instruments. PI was calculated as weight (grams)/Length³ (cm) × 100; and values below were taken as indicative of growth retardation.⁷ All these data were recorded on the predesigned form, for each baby. On the basis of normograms of the Alexander and associates intrauterine growth curves,⁸ newborns were classified as SGA and appropriate for gestational age (AGA). Infants, whose weights were below the 10th percentile for their GA, were classified as SGA, whereas those with birth weight between 10th-90th percentiles for their GA were designated as AGA babies.⁹

CAN score has nine superficial readily detectable signs, which are rated from 1 (worst-severe FM) to 4 (best well-nourished). The highest possible score is 36 and lowest possible score is 9. A CAN score of ≤24 was taken as fetally malnourished.

Data were statistically analyzed using SPSS version 22 software. Use of test of significance, calculated by chi-square test. Anthropometric measurements were expressed as percentiles. Sensitivity, specificity, positive and negative predictive values were also calculated, wherever required. A 'p' value of <0.05 was considered significant.

RESULTS

In this study, 100 term neonates were studied to detect fetal malnutrition. Mean birth weight of study population was 2.61 ± 0.31 kg and the mean length was 46.13 ± 2.15 cm. In our study, when nutritional status of newborns was detected by CAN score, 84% newborns were well-nourished but 16% newborns had malnutrition. When nutritional status of newborns was detected on the basis of weight for GA, we found that 63% babies were SGA, while 37% were AGA. When PI was used for detection of nutritional status in newborns, it was found that 91% newborns were well-nourished but 9% were malnourished.

In our study, 16 of 100 term neonates, were malnourished *in utero*. Thus, 43 out of 63 SGA babies were small but not malnourished and 3 out of 37 AGA were fully grown but were malnourished. Nine babies were found to have Fetal malnutrition using PI but by applying CAN score only 4 babies were found to have Fetal malnutrition. Out of the 91 babies found to be well nourished by using PI, 12 babies were found to be malnourished *in utero* by applying CAN score. PI has low sensitivity in comparison to CAN score for diagnosis FM. Also, using PI alone for diagnosing fetal malnutrition, some SGA babies may be misdiagnosed as FM and some AGA babies may be misdiagnosed as normal.

DISCUSSION:

It is important to recognize babies with foetal malnutrition because of high incidence of neonatal morbidity.⁵ Fetal malnutrition adversely affects body composition, including reduced muscle mass and protein content, metabolic, and enzyme functions. FM is clinically characterized by obvious intrauterine loss of subcutaneous fat and muscle. Weight, length and head circumference may or may not be affected.⁶

The current anthropometric criteria used to assess fetal nutritional status of newborn, have their shortcomings.⁷ A simple, clinically applicable scoring system was developed by Metcoff³ to differentiate the malnourished from appropriate nourished babies irrespective of birth weight or clinical classification as IUGR, SGA, or AGA. This scoring system rated clinical evidences of malnutrition in term babies determined by loss of subcutaneous tissue and muscle and is independent of common confounding factors which affect weight of the baby.

The CAN score is much simpler to learn and easy to do, particularly

with the aid of cartoon illustrations of the signs and scores as described by Metcoff.⁴

In the study by Hill et al,⁸ 32.6% of infants with fetal malnutrition would have been wrongly classified as AGA, if only birth weights, lengths and head circumferences were considered for detection of growth retardation. In our study, using CAN score, 68 % of SGA infants were not malnourished and 8% of AGA infants were fetally malnourished. Thus, apart from 32% of the SGA, 8% of the AGA malnourished babies are also at risk. Metcoff⁴ established CAN score as a good indicator of FM. Our data and previous reports⁴ suggest that using weight for gestation classification to identify malnourished neonates may not be entirely accurate, because it may identify many well-nourished neonates as SGA, or miss a proportion of malnourished AGA neonates.

To classify IUGR infants, PI has been used by various authors. In our study, 9 infants were found growth retarded according to PI (<2.2); out of these only 4 infants were fetally malnourished on using CAN score. When CAN score was compared with PI, it gave a sensitivity of 25% and a specificity of 94% in the present study. Haggarty et al²¹ indicate that PI is a poor predictor of *in utero* growth retardation.¹⁰

Deodhar et al¹¹ state that CAN score is a simple and rapid clinical scoring system for diagnosing FM. In a developing country like India, CAN score can be used as a simple and effective tool to identify FM. The limitation of our study was small sample size and inability for long-term follow-up to assess development of these babies.

CONCLUSION:

Our study concluded that SGA and IUGR are not synonymous with FM. CAN score, which is a simple clinical index for identifying FM, is a good indicator for the same in comparison to other methods of determining IUGR-like weight for gestational age and PI. This implies that CAN score can identify fetal malnourishment in those neonates, which are missed by other methods.

REFERENCES:

1. Clifford SH. Postmaturity, with placental dysfunction: clinical syndrome and pathologic findings. *J Pediatr* 1954;44(1):1-13.2. Scott KE, Usher R. Fetal malnutrition: its incidence, causes, and effects. *Am J Obstet Gynecol* 1966;94(7):951-63.
3. Georgieff MK, Sasanow SR. Nutritional assessment of the neonate. *Clin Perinatol* 1986;13(1):73-89.
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.
5. Gluckman PD, Hanson MA, Morton SM, Pinal CS. Life- long echoes - a critical analysis of the developmental origins of adult disease model. *Biol Neonate* 2005;87(2):127-39.
6. Mehta S, Tandon A, Dua T, Kumari S, Singh SK. Clinical assessment of nutritional status at birth. *Indian Pediatr* 1998;35(5):423-8.
7. Deodhar J, Jarad R. Study of the prevalence of and high-risk factors for fetal malnutrition in term newborns. *Ann Trop Paediatr* 1999;19(3):273-7.
8. Hill RM, Verniaud WM, Deter RL, Tennyson LM, Rettig GM, Zion TE, et al. The effect of intrauterine malnutrition on the term infant. A 14-year progressive study. *Acta Paediatr Scand* 1984;73(4):482-7.
9. Miller HC, Hassanein K. Diagnosis of impaired fetal growth in newborn infants. *Pediatrics* 1971;48(4):511-22.
10. Haggarty P, Campbell DM, Bendomir A, Gray ES, Abramovich DR. Ponderal index is a poor predictor of *in utero* growth retardation. *BJOG* 2004;111(2):113-9.
11. Gardosi J, Chang A, Kalyan B, Sahota D, Symonds EM. Customised antenatal growth charts. *Lancet* 1992;339(8788):283-7.