Nat. Volatiles & Essent. Oils, 2021; 8(5): 388 – 395

NVEO
Natural Volatiles & Essential Oils

Study On Nutritional Status Of Neonate Using Can Score In Determining Intrauterine Growth And Its Comparison With Other Methods In Identifying Fetal Malnutrition

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Abstract

Introduction: An inadequate supply of nutrients to the foetus results in foetal malnutrition. As a result, the foetus fails to grow, resulting in intrauterine growth restriction (IUGR). Though Small for Gestational Age (SGA) is used synonymously with IUGR, the latter shows evidence of malnutrition. To detect foetal malnutrition, various methods are being used currently. CAN is a clinical method for detecting nutritional status through physical examination. The detection of foetal malnutrition by CAN score and comparing it with other methods was the aim of this study. **Materials and methods:** This hospital-based prospective study was carried out on 200 neonates delivered in the district government hospital, Koppal. Nutritional status assessment was done using the CAN score and was compared with ponderal index and birth weight for gestational age. **Results:** The incidence of foetal malnutrition was 41.5% using the CAN score. When measured using the CAN score, 10.5% of small for gestational age neonates were well nourished and 7% of appropriate for gestational age neonates were malnourished.14% of neonates showed malnutrition with PI 2.5, but when detected through CAN score it was 8%. Well-nourished neonates with PI > 2.5 were 86%, but after CAN score, 33.5% showed malnutrition. When compared with the CAN score, PI had 19.27% sensitivity and 89.74% specificity, while birth weight for gestational age had 83.13% sensitivity and 82.05% specificity. **Conclusion:** The CAN score is the best method for detecting foetal malnutrition without the use of any instrument. It can detect malnutrition which is missed by other commonly used methods.

Keywords: Intrauterine growth restriction, foetal malnutrition, small for gestational age, appropriate for gestational age, CAN score.

Introduction:

Intrauterine growth restriction (IUGR) is a clinical condition in which the foetus fails to grow during pregnancy. It is an adverse foetal condition that accounts for perinatal morbidity and mortality. Improper supply of nutrients with limited oxygen to the foetus from the mother results in intrauterine growth restriction. Failure to acquire sufficient muscle mass and fat during intrauterine growth is known as foetal malnutrition (FM). This in-utero state of poor nutrition is a result of inadequate supply and or utilization of nutrients. The term "foetal malnutrition" was coined by Scott and Usher in 1966 to describe infants who showed evidence of soft tissue wasting at birth irrespective of specific etiology1.

Early detection of intrauterine growth restriction is important for the timely management of short-and long-term sequelae. Despite the identification of several risk factors, the underlying mechanism of IUGR development remains unknown. IUGR influences about 8% of all pregnancies. The rate of foetal malnutrition continues to be high in India at around 30%, compared to 5-7% in developed countries. Many factors influence foetal growth, including nutritional status, maternal habits, placental function, and the

genetic makeup of the fetus.

Placental insufficiency, small for gestational age (SGA), and IUGR are the current terms used to describe intrauterine malnutrition. These terminologies are not synonymous with FM as none of these strategies survey the subcutaneous fat gathered. Additionally, newborns with ailing health in the late third trimester may have a birth weight of over 2.5 kg and are misdiagnosed as typical in spite of being malnourished. The significance of tending to this issue of foetal malnutrition is emphasized due to the serious sequelae of malnutrition on numerous organ frameworks. 39% of malnourished neonates had neurological and intellectual handicaps. The purpose of this study was to assess the nutritional status of neonates using the Clinical Assessment of Nutritional (CAN) score and compare it with other methods of foetal malnutrition assessment.

Materials and methods:

This prospective study was carried out on neonates delivered at the district government hospital in Koppal. This work was carried out after taking institutional ethical committee clearance. This work was carried out for a period of 3 months.

Inclusion criteria:

- Maternal age between 18-35 years
- Gestation age between 34-42 weeks
- Singleton pregnancy
- Infants with no congenital anomalies

Exclusion criteria:

- Multiple pregnancies
- Preterm neonates
- Unknown gestational age.
- Neonates with congenital anomalies, intrauterine death and still birth
- Mother has gestational diabetes and cardiovascular disease.

An electronic weighing scale was used to record the weight without any clothes wrapped around the neonate. An infantometer was used to measure length. Neonates were classified based on weight and length that were plotted on intrauterine growth charts into small for gestational age (SGA), appropriate for gestational age (AGA) 5,6,20. Ponderal index (PI) = weight (gms) 100/length (cm) 3. PI 2.2 was considered as malnutrition 7, 21, 42. Clinical assessment of nutritional status (CAN) is a scoring framework described by Metcoff in 1994. It is based on nine superficial promptly distinguishable signs of malnutrition in neonates. Each sign is rated from 4 (no malnutrition) to 1 (malnourished). A CAN score of 25 indicates foetal malnutrition8. The score was taken within 48 hours of birth.

Statistical techniques

The collected data was statistically analysed using Microsoft Excel (Version 2003). A Chi-square test was used. Sensitivity, specificity, positive predictive value and negative predictive values were calculated. The values were expressed as the percentage,

Results:

This study was carried out on 200 neonates, 110 of whom were females and 90 were males. The total incidence of FM was 41.5%, which was observed through the CAN score (Table-1). The incidence of FM was equal in predisposition between female and male neonates (Graph 1).

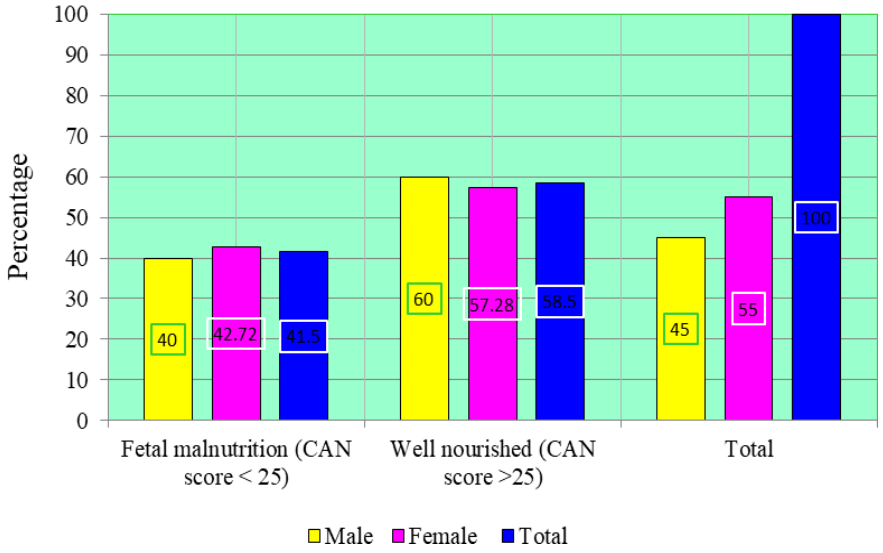
1. Incidence of fetal malnutrition:

We found 117 (58.5 %) well-nourished and 83 (41.5 %) malnourished neonates when detected through CAN score.

Table -1: Incidence of fetal malnutrition

Parameter	Male (%)	Female (%)	Total (%)
Fetal malnutrition (CAN score < 25)	36 (40%)	47 (42.72%)	83 (41.5%)
Well nourished (CAN score >25)	54 (60%)	63 (57.28 %)	117 (58.5%)
Total	90 (45%)	110(55%)	200 (100%)

Graph - 1. Incidence of fetal malnutrition



Graph 1 depicts incidence of fetal malnutrition in male and female neonates. Each vertical bar represents the percentage fetal malnutrition and well-nourished at <25 and >25 respectively.

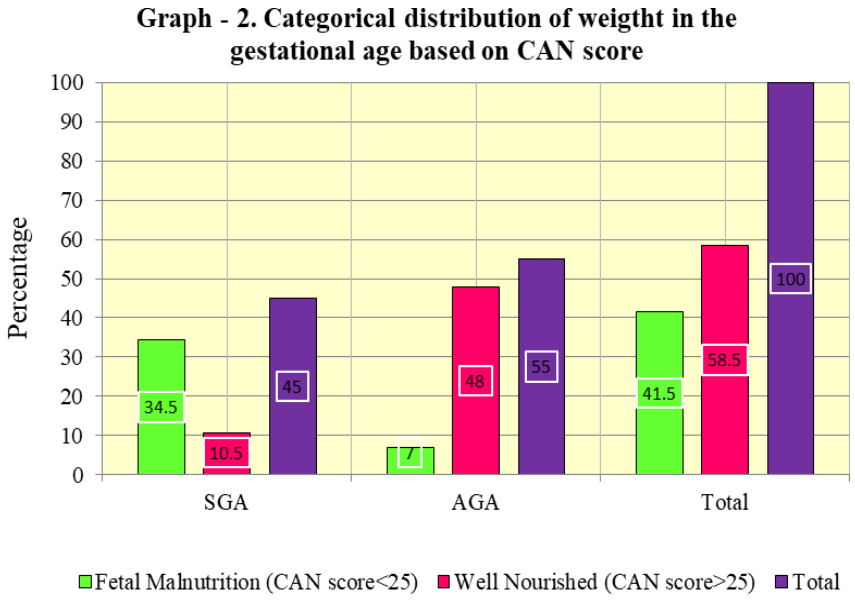
2. Weight of the fetus based on CAN score

We found 90 (45%) SGA neonates and 110 (55 %) AGA neonates when detected through weight for gestational age. FM was observed in 83 (41.5%) neonates while 117 (58.5%) were well nourished neonates (Table -2 & Graph – 2).

Table -2: Categorical distribution of weight in the gestational age based on CAN score

th weight for GA	etal Malnutrition (CAN score<25)	Well Nourished (CAN score>25)	Total
SGA	69 (34.5%)	21 (10.5%)	90 (45%)
AGA	14 (7%)	96(48 %)	110 (55%)
Total	83 (41.5%)	117 (58.5%)	200 (100 %)

GA: gestational age, SGA: small for gestational age, AGA: Appropriate for gestational age



Graph 2 shows distribution of weight in the gestational age based on CAN score. Each bar represents the percentage. GA: gestational age, SGA: small for gestational age, AGA: Appropriate for gestational age.

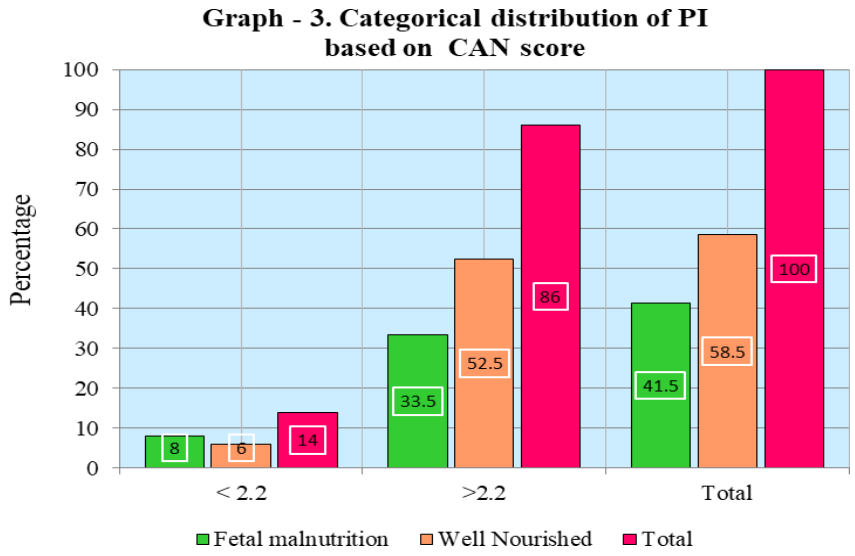
3. PI based on CAN score:

Classification through Ponderal index (PI) showed 28 (14%) showed FM while 172 (86%) were well nourished. Overall, our study detected 83 FM out of 200 neonates. Out of 200 neonates CAN score detected 83 (41.5%) FM, while 28 (14%) were detected through PI.After applying CAN score 12(6%) neonates were well nourished. Remaining well-nourished neonates with typical PI, 67 (33.5%) had significant malnutrition (Table -3 & Graph – 3).

Table -3: Categorical distribution of PI based on CAN score

PI	Fetal malnutrition	Well Nourished	Total
< 2.2	16 (8%)	12 (6%)	28 (14%)
>2.2	67 (33.5%)	105 (52.5%)	172 (86%)
Total	83 (41.5%)	117 (58.5%)	200 (100)

PI: ponderal index.



Graph 3 displays categorical distribution of Ponderal index (PI) in the neonates. Each bar denotes the percentage of the fetal malnutrition and well-nourished based on CAN score at

<2.2 and >2.2.

4. Comparison with other methods of detecting FM

Validity measures to detect FM are compared with CAN score (Table-4). When compared with CAN score PI showed low sensitivity of 19.27% with 89.74% specificity. It had

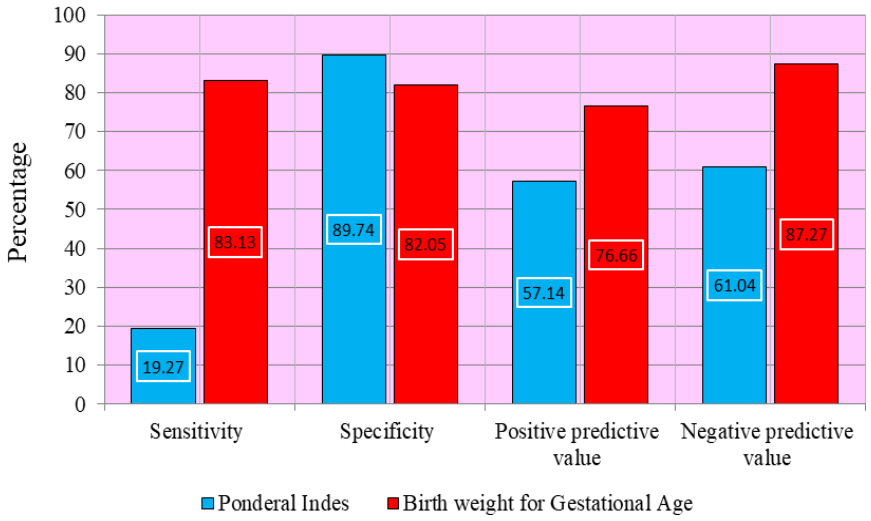
57.14 and 61.04% positive predictive and negative predictive value respectively. Birth weight for gestational age has a sensitivity of 83.13%, 82.05% specificity, 76.66% positive predictive value and 87.27% negative predictive value when compared with CAN score (Graph – 4).

Table -4 CAN score comparison with other methods of detecting FM

Value	**PI**	**Birth weight for GA**
Sensitivity (%)	19.27%	83.13%
Specificity (%)	89.74%	82.05%
Positive predictive value (%)	57.14%	76.66%
Negative predictive value (%)	61.04%	87.27%

PI: ponderal index; GA: gestational age.

Graph - 4. CAN score comparison with other methods of detecting FM



Graph 4 exhibit comparison of CAN score with Ponderal index (PI) and Birth weight for gestational age to detect fetal malnutrition. Each value is expressed in percentage. PI: ponderal index; GA: gestational age.

Discussion

IUGR, SGA, and placental insufficiency are different terms used to detect neonatal nutritional deficiencies, but none are synonymous with FM9. A good indicator of foetal wellbeing is intrauterine growth. A low-cost and effective method that has been extensively used to determine intrauterine growth is anthropometry10.

In our study, the incidence of FM was 41.5%, which was more than the values observed by Metoff (10%). Soundarya M et al.11 reported a 24% incidence, Kumari12 a 27.4% incidence, and 27.97% by Sankhyan et al. (2013) and 28% by Rao14. Maternal poor nutritional status, rural areas, and low socio-economic status might be causes of higher incidence. Adebami et al15 reported 18.8% FM while 81.2% were well-nourished. We found 58.5% well-nourished and 41.5% FM based on CAN score, which coincides with the findings of Mehta et al.16, where FM was 40.3% while 59.97% were well-nourished.

In our study, when classified by weight per gestational age, 55% were AGA while 45% were SGA. This is close to the findings of Rao et14 al with 58.3% AGA and 41.7% SGA. When detected through CAN score, 7% of AGA had FM, while 10.5% of SGA were well nourished in our study. These findings are close to the findings of Soundarya et al.11, where 77% were AGA, 23% were SGA, and 8.2% of FM in AGA and 23% of SGA were well nourished. In a study by Amarendra et al.17, they reported 83% FM out of 100 SGA neonates, while 58.6% of AGA neonates had FM. Intrauterine growth charts are the diagnostic tools for SGA, hence FM was more in SGA. This classification may miss some neonates with FM who are not SGA.

On the basis of PI, 14% FM was detected out of which CAN showed 8% FM. Amarendra et al. (17) classified 61.6% of neonates as FM. PI showed 29.19 % FM in a study conducted by Mehta et al16. In a study by Vikram Singhal et al18, PI detected 16 (8%) neonates with FM, out of which only 10 neonates were malnourished when CAN score was applied. In acute malnutrition at the expense of weight, length will be spared. PI may misclassify neonates with chronic insult in utero as length and weight may be affected in neonates, 3, 16, 18.

In our study using CAN score, the sensitivity and specificity of birth weight for gestational age was 83.13% and 82.05% respectively, which is less than Amarendra et al17 (51% sensitivity and 21.5% specificity). PI showed 19.27% sensitivity and 89.74% specificity using the CAN score in our study, while Amarendra et al.17 reported 69.5% sensitivity and 55.6% specificity. In a study by Lakshmi et al.19, they observed a sensitivity of 15% and a specificity of 96.96% using PI. These values are close to our present study.

Conclusion:

A major problem in developing countries is foetal malnutrition. Our study re-emphasizes Metcoff et al.'s observations that foetal malnutrition is not synonymous with SGA and IUGR. Classification based on birth weight for gestational age into SGA and AGA showed well-nourished and malnourished neonates respectively in our study. Hence, this may misdiagnose the neonates. PI is not a suitable method due to its failure to adjust for all gestational weeks. The CAN score is the best clinical marker for detecting IUGR when compared to other methods. PI can be combined with CAN score to get better results than using PI alone. The CAN score detects foetal malnutrition which is escaped by other methods. This simple and non-invasive method is a boon to primary health setup when adequate health professionals are not there. It is a low-cost and effective method of detecting malnutrition, mainly in rural hospitals, without the need for any special instruments. More studies should be conducted by CAN score in low socioeconomic, rural and semi-rural areas to study the prevalence.

Funding: Nil

Conflict of interest: None

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