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Research Article

Prevalence of fetal malnutrition and efficacy of CAN Score in identifying fetal malnutrition.

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Abstract

Background: Clinical Assessment of Nutritional Score (CAN score) is another method of clinical assessment of nutritional status in the basis. Babies with CAN score below 24 is considered as having FM. This is a purely clinical score for gestational age, so, its very easy to be done. It detects neonates with FM whether small, appropriate or large for gestational age. CAN score is used to distinguish malnourished from well-nourished babies. **Objective:** Prevalence of fetal malnutrition and efficacy of CAN Score in identifying fetal malnutrition. **Methodology:** Present Hospital Based Screening Study was carried out at Department of Paediatrics, Deccan College of Medical Sciences, Hyderabad during the period from July 2024 to June 2025. **Results:** Mean age and gestation age of the mothers in the present study was 30.15 years and 38 weeks while mean BMI was 27.95 Kg/ m2. A total of 38.7% babies were small for gestation age while 1.3% were large for gestation age. Fetal Malnutrition as per MAC/ HC ratio was seen in 17.3% babies. Fetal Malnutrition as per Ponderal Index was seen in 16% babies. Fetal Malnutrition as per CAN score was seen in 26% babies. **Conclusion:** Fetal Malnutrition as per MAC/ HC ratio was seen in 17.3% babies. Fetal Malnutrition as per Ponderal Index was seen in 16% babies. Fetal Malnutrition as per CAN score was seen in 26% babies.

Key words: Prevalence, fetal malnutrition, CAN Score

Introduction

Fetal malnutrition (FM) is failure to obtain enough quantum of fat and muscle mass during intrauterine growth. This term is coined by Scott and Usher [1]. In severe FM, the neonate may look skinny (skin looks so large for the baby) [2]. FM can occur at any gestational age and birth weight [1,3]. Studies showing that around 40% of babies with FM had intellectual and neurological disability [4].

The existing terminologies for describing fetal malnutrition (FM) include: small for gestational age (SGA), small for date, pseudo-premature, placental dysfunction, chronic fetal distress, intrauterine growth restriction (IUGR) and dysmature babies. None of these terminologies is actually synonymous with FM as none of these methods assess the subcutaneous fat accumulated nor are they population varied, instead are common for various populations despite their genetic and ethnic variations. Similarly, newborns with malnutrition in late third trimester may have a birth weight of above 2.5 kg and are misdiagnosed as normal despite being malnourished. By intrauterine growth chart, the SGA baby or a baby with IUGR, the birth weight is below 10th percentile for gestational age [5]. Not all SGA babies have features of FM [6-9]. Placental dysfunction is used to describe a state of undernourished fetus [10]. Many post-term babies do not suffer placental inefficiency. [11]

Many studies on fetal wasting adopted the nomenclature of FM [1,6,7,12,13]. Birth weight was the most common standard adopted by authors, the cut off levels used have been birth weight less than 2500 gms. This method do not identify FM which indicates a clinical state that may be present at almost any birth weight [14-17].

Clinical Assessment of Nutritional Score (CAN score) is another method of clinical assessment of nutritional status in the basis. Babies with CAN score below 24 is considered as having FM. This is a purely clinical score for gestational age, so, its very easy to be done. It detects neonates with FM whether small, appropriate or large for gestational age. CAN score is used to distinguish malnourished from well-nourished babies [6].

Hence, the present study was carried out to identify the prevalence of fetal malnutrition by using CAN score and compare it with other anthropometric indices.

Objective: Prevalence of fetal malnutrition and efficacy of CAN Score in identifying fetal malnutrition.

Materials and methods

Study Design: A Hospital Based Screening Study

Study Duration: One year (From July 2024 to June 2025)

Study Area: Department of Pediatrics, Deccan College of Medical Sciences, Hyderabad

Sampling Technique & Sample Size: Take the prevalence of low birth babies as 20-30% as per previous studies, and excluding the premature category which amounts for 10%, the expected prevalence taken is 15%. Hence p=0.15 and q=0.85. With 95% level of confidence and z value of 1.96 and with precision of 5% (d=0.05), applying the formula: $n= 2z \times p (1-p)/d^2$, the estimated sample size is 200.

Inclusion criteria

1. Live born singleton infants with gestational age >37 weeks
2. Newborns with known gestational age (LMP/New Ballard score)

Exclusion criteria

1. Newborns with congenital anomalies
2. Newborns <37 completed weeks gestation
3. Newborns born to mothers with unreliable estimation of gestational age

Study Methodology

Gestational age was determined from the date of the last menstrual period (LMP) in concordance with clinical assessment by New Ballard's Scoring and ultrasonography. Growth lag on sonography was identified using BPD value and those with values below 5th centile for the respective gestation age were considered as having growth lag. The following parameters were recorded in all babies (weight was recorded at birth, length, mid arm circumference and head circumference between 24-48 hours of life. Doppler studies were recorded as per third trimester reports):

a. **Birth weight:** Nude birth weight, to the nearest 5 gms using electronic weighing scale.

b. **Crown to Heel Length:** Length to the nearest 0.1cm using an Infantometer.

c. **Occipito-frontal circumference**: to be taken as the largest circumference of the skull using a flexible non stretchable tape to the nearest 0.1cm.

d. **Mid Arm Circumference**: to be measured in the left arm, at a point midway between tip of the acromion and the olecranon process using a flexible non stretchable tape to the nearest 0.1cm.

e. **Ponderal index (PI):** To be calculated using the following formula

PI = Weight (gm) ×100/ Length (cm)3

Ponderal index of less than 2.2 gm/cm^3 has to be considered as an index of malnutrition [5].

f. **Mid arm circumference/head circumference Ratio (MAC/HC):** A cut off value of < 0.27 was used in this study to define malnutrition [123].

g. **Clinical assessment of nutritional status (CAN) score:** Clinical assessment of nutritional status will be done on the basis of readily detectable signs of malnutrition as given by Scott and Usher (appendix I)

Statistical Analysis

All the collected data was entered in Microsoft Excel Sheet. The data was then transferred and analyzed using SPSS ver. 17. Qualitative data was represented in the form of frequency and percentage and compared using chi-square test. Quantitative data was represented using Mean +/- S.D and compared using unpaired t-test. Correlation between two continuous variables was done using Pearson correlation coefficient. A p-value of < 0.05 was taken as level of significance.

Results:

Table 1. Mean Baseline Variables of study subjects

Variables	Mean	SD
GA (weeks)	38.06	0.87
Maternal Age (yrs.)	30.15	2.79
Maternal Weight (Kg)	70.77	4.35
Maternal Height (m)	1.59	0.047
Maternal BMI (Kg/m2)	27.95	1.95

Mean age and gestation age of the mothers in the present study was 30.15 years and 38 weeks while mean BMI was 27.95 Kg/ m^2.

Table 2. Distribution of study subjects based on Gender of Baby

Sex	N	%
Male	77	51.3%
Female	73	48.7%
Total	150	100.0%

Out of the total 150 babies, 51.3% were males and 48.7% were females.

Table 3: Distribution based on Weight for Gestation age

Newborn	N	%
AGA	90	60.0%
SGA	58	38.7%
LGA	2	1.3%
Total	150	100.0%

A total of 38.7% babies were small for gestation age while 1.3% were large for gestation age.

Table 4: Distribution based on Ratio of Mid arm to Head circumference

MAC/ HC (< 0.27)	N	%
No	124	82.7%
Yes	26	17.3%
Total	150	100.0%

Fetal Malnutrition as per MAC/ HC ratio was seen in 17.3% babies

Table 5: Distribution based on Ponderal index

Ponderal Index (< 2.2)	N	%
No	126	84.0%
Yes	24	16.0%
Total	150	100.0%

Fetal Malnutrition as per Ponderal Index was seen in 16% babies.

Table 6: Distribution based on CAN Score

CAN Score (< 24)	N	%
No	111	74.0%
Yes	39	26.0%
Total	150	100.0%

Fetal Malnutrition as per CAN score was seen in 26% babies.

Discussion

In developing countries low birth weight is a common clinical problem with long term

implications on the growth, neurodevelopment, morbidity and mortality. The existing indicators of nutritional status do not accurately assess the nutrition which is best assessed by the amount of subcutaneous fat accumulated in the in-utero period.

Ultrasonographic measurements were most commonly used to classify babies as SGA or AGA. But not all SGA babies have features of fetal malnutrition (FM), also in babies with malnutrition in late third trimester may have a birth weight of above 2.5 kg and are misdiagnosed as normal despite being malnourished [6-9]. Various other methods used by clinicians include: Ponderal index, Body mass Index, mid-arm circumference/ Head circumference ratio, chest circumference and/or mid arm circumference to head circumference ratio and head circumference to length ratio. Clinical Assessment of Nutritional Score (CAN score) is another method of clinical assessment of nutritional status in the basis. Babies with CAN score below 24 is considered as having FM. This is a purely clinical score for gestational age, so, its very easy to be done. It detects neonates with FM whether small, appropriate or large for gestational age [6].

Out of the total 58 SGA subjects, CAN score identified 26 (44.8%) as malnourished. While out of 90 AGA subjects, it identified 13 (14.4%) as malnourished. The sensitivity and specificity of CAN score as a screening tool for fetal malnutrition was 44.8% and 85.6%.

Several authors i.e. Jasmin et al. [18] Mahalingam Soundarya et al. [19], Vikram Singhal et al. [20], O. J. Adebami et al. [21], Abhaykumar Dhanorkar et al. [22], and Liladhar Kashyap et al. [23], have stressed on the usefulness of CAN score in detecting fetal malnutrition. The sensitivity and specificity of CAN score as observed in present study is in accordance with Jasmin et al. [18] (53% and 84.2%) and Soundarya M et al study [19] (50% and 93%) respectively. Singhal V et al. observed the sensitivity and specificity of weight for gestational age as 82.85% and 41.81% respectively when CAN score was taken as standard [20]. In a study by Thammanna PS et al., 6.4% of Appropriate for gestational age babies were identified as malnourished by CAN score and Weight for age had sensitivity of 83.58% in identifying fetal malnutrition [24].

Conclusion: Fetal Malnutrition as per MAC/ HC ratio was seen in 17.3% babies. Fetal Malnutrition as per Ponderal Index was seen in 16% babies. Fetal Malnutrition as per CAN score was seen in 26% babies.

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