

## Original Research Article

# A STUDY ON CAN (CLINICAL ASSESSMENT OF NUTRITION) SCORE AND ITS CORRELATION WITH GESTATIONAL AGE

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### ABSTRACT

**Background:** The primary objective of the study was to assess the nutritional status of newborn babies using clinical assessment of nutritional score (CAN SCORE) within 48 hours after birth and categorise them into nourished and malnourished. The secondary objective was to find the association of CAN SCORE with (1) neonatal clinical parameters.

**Materials and Methods:** A comparative, hospital-based cross-sectional observational study was done on 200 newborn babies delivered in Mallareddy Medical College for Women and Hospital. The study was done for 1 year, from December 2020 to December 2021. The newborn parameters used to assess the nutritional status were CAN SCORE and Anthropometric measurements. The analysis used the Special Package for Social Sciences (SPSS), and a p-value of < 0.05 was considered significant.

**Results:** The nutritional status of the newborns was assessed based on CAN SCORE, which showed that 127 (63%) babies had fetal malnutrition, with CANSORE <25 and 73 (37%) being well nourished with CANSORE >25. The association of CAN SCORE with different parameters was evaluated to reach a result. 70% of late pre-term and 65% of term babies were malnourished, proving a statistically positive association. 63.5% of the newborns were malnourished whereas weight for gestation age identified 38% as SGA and 62% as AGA with a p-value of 0.017. The association between neonatal BMI and CAN SCORE was statistically significant, with a p-value of 0.016 (<0.05). The association between Ponderal Index and CAN SCORE was statistically significant, with a p-value of 0.008 (<0.05).

**Conclusion:** The CANSORE has a statistically significant association with gestational age, birth weight according to gestational age, neonatal BMI, ponderal index and maternal anaemia status.

**Keywords:** Nutritional Score, Malnourished, New Born babies.

## INTRODUCTION

The aim of nutrition in the prenatal and postnatal periods is to ensure a smooth transition of the foetus to the newborn.<sup>[1]</sup> The first 1,000 days of life is a unique period that builds a foundation for optimal growth and neurodevelopment. The first 1,000 days include 270 days of intrauterine and 730 days of the postnatal period. The gestational age and birth weight being good predictors of survival, neonatal growth, and overall development, are not good at predicting

the nutritional status at birth, which is considered the key factor in the overall development of the newborn. FM in the uterus occurs mainly due to an inadequate supply of nutrients or less utilisation of those nutrients., leading to a foetus not being able to acquire adequate fat, subcutaneous tissue and muscle mass during intrauterine growth.<sup>[2]</sup> The concept of foetal malnutrition was developed in 1954 by Clifford and Scott & Usher, and they defined “fetal malnutrition as a clinical state characterised by obvious intrauterine loss or failure to acquire the

normal amount of subcutaneous fat or muscle”.[3,4] FM may be found in any newborn irrespective of weight/ IUGR status. FM affects various body tissues by reducing the protein content and muscle mass, organ development and bone formation, which also affects the metabolic & enzymatic function of the body.

Low birth Weight (LBW) is a major determinant of the nutrition status of growing infants, and the most commonly used method in classifying infants is based on birth 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). Unfortunately, this method does not indicate the overall neonatal nutritional status at birth. Foetal malnutrition is even found in AGA babies; SGA babies don't have to have FM, thus proving that foetal malnutrition (FM), the term SGA and IUGR are not synonymous,[3] and one may occur with or without the other.[6-8] The most common method used to distinguish symmetric and asymmetric IUGR is Roherer's Ponderal index (PI).[5,9]

Several studies have assessed the correlation of CAN SCORE with gestational age and anthropometric measurements. Metcoff (1994), conducted a large study where he devised the present CANSORE for the assessment of Fetal malnutrition and concluded that not all SGA babies had fetal malnutrition and not all AGA babies were well-nourished.[3]

Several studies conducted on CAN SCORE at birth by Mehta S et al,[10] Deodhar J et al,[11] Gilner K et al.[12] Divya Tailor et al, Agal P et al,[13] B. N. Ezenwa et al. and many more have proved that CANSORE is a simple bedside clinical index and a good predictor for morbidity and mortality associated with fetal malnutrition without any specialised equipment and is more sensitive when compared with other methods like birth weight for gestational age and PI.[1,2,10-30] Studies on the assessment of maternal parameters like Age, Parity, BMI and anaemia were done by Adebami OJ,[31] and Ajay Mohan Varahala et al,[32] conducted studies on maternal nutrition playing an important role in newborn nutrition and concluded that (1) gross improvement in nutritional status and socio-economic status (SES) of the mother is likely to decrease the incidence of fetal malnutrition at birth. (2) maternal factors play a major role in the size of the newborn at birth and fetal malnutrition is highly influenced by parity, maternal haemoglobin status and mode of delivery. This proves that CAN SCORES and maternal factors are important in determining the nutritional status of the newborn.

As foetal malnutrition is a major public health problem with high neonatal morbidity and mortality rate and assessing and may be missed by assessing only the birth weight. So this study was conducted to assess the nutrition status of the newborn by CANSORE, which is an easy tool for identifying malnutrition and can help in appropriate interpretation and better outcomes.

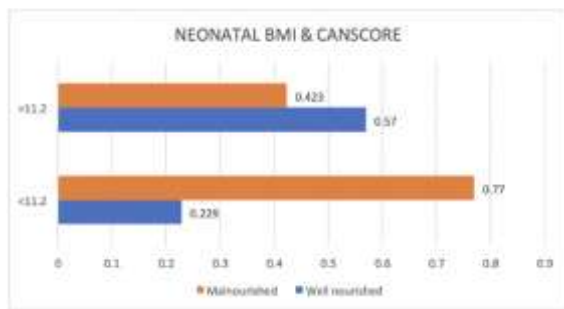
## MATERIALS AND METHODS

This was a hospital-based cross-sectional, comparative study with 2 objectives. The study's primary objective was to assess the nutritional status of newborn babies using clinical assessment of nutritional score (CAN SCORE) within 48 hours after birth and categorise them into nourished and malnourished. The secondary objective was to find the association of CAN SCORE with (1) neonatal clinical parameters like gestational age, weight for gestational age, Ponderal Index (PI), Neonatal Body Mass Index (BMI) & Sex and (2) maternal parameters like Age, Parity, BMI and anaemia. The study was conducted between December 2020 and December 2021 at Mallareddy Medical College for Women and Hospital and was based on the number of deliveries that occurred during the last 6 months in the hospital. The sample size was 200 newborn babies delivered during this period. The selection was based on the inclusion and exclusion criteria. The inclusion criteria was (!) All live newborn of gestational age above 34 weeks who were delivered in Mallareddy medical college for women and hospital (2) Newborn babies with known gestational age by last menstrual period and (3) Neonates whose hospital stays exceeded 24 hours of age. The following were excluded from the study (1) Mothers with no record of previous AN checkup and weight (2) Newborns with gestational age less than 34 weeks (3) Newborns with major congenital malformation and chromosomal defects (4) Newborns whose hospital stay was less than 24 hours and (5) Newborns whose parents did not give the consent for enrolling in this study. Harson's electronic weighing machine, non-stretchable, flexible measuring tape and infantometer was used for measurements.

The clearance for this study was obtained from the Institutional Research and ethical committee, following informed consent from the mother. Newborn's general information was filled in the standardised proforma after delivery. Maternal details were taken from the mother's case sheet, including age, consanguinity, obstetric scoring, birth order, last menstrual period (LMP) to calculate gestational age (confirmed by The new Ballard Score) and records of maternal anthropometry. Anthropometric measurements and CANSORE were recorded using standardised techniques. The anthropometric measurements including length, birth weight [naked birth weight classifying babies into small for gestational age (SGA), appropriate for gestational age (AGA) and low for gestational age (LGA)], head circumference, Ponderal index [(PI) birth weight in gms x100/length in cm<sup>3</sup>], Body mass Index [(BMI)- weight (kg)/ length (meter)<sup>2</sup> and documented. The new Ballard score was performed on all the newborns within 30 min to 24 hours to estimate the gestational age. Clinical assessment of Nutrition Score (CAN SCORE) was performed within 24-48 hours after birth and based on the total



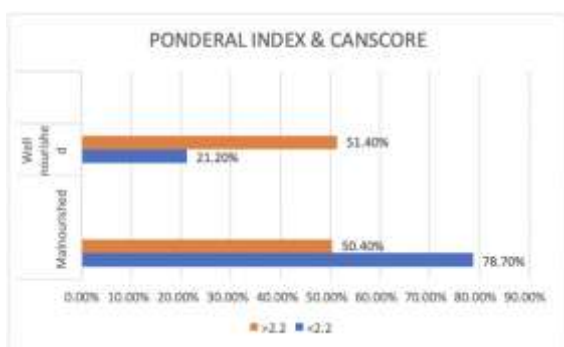
were diagnosed as malnourished. And the association is statistically significant, with a p-value of 0.016 (<0.05) [Figure 3].



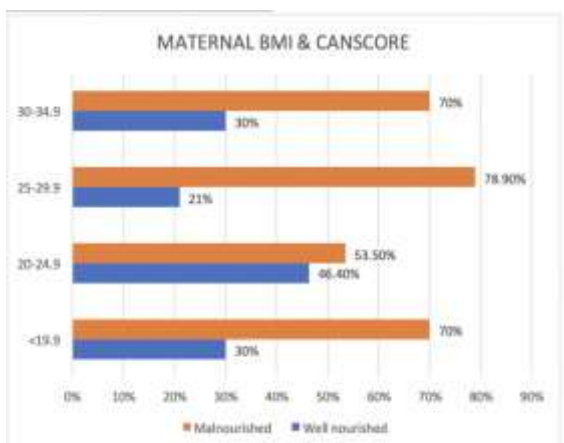
**Figure 3: Association between neonatal BMI and CAN SCORE**

#### Association between Ponderal Index and CAN SCORE

Out of 200 newborns, CANSCORE identified 127 (63.5%) babies as malnourished, whereas PI identified 99 (49.5%) as malnourished. The association is statistically significant with a p-value of 0.008 (<0.05) [Figure 4]



**Figure 4: Association between Ponderal Index and CAN SCORE**



**Figure 5: Association between Maternal BMI and CAN SCORE**

#### Association between Maternal BMI and CAN SCORE

Out of 200 newborns, 40 (20%), 112 (56%), 38 (19%), 10 (5%) & 0 were born to mothers with low BMI, normal BMI, overweight, obese and morbidly

obese respectively. Using CAN SCORE, the analysis showed that (1) Of the 40 low BMI mothers, 28 (70%) newborns were malnourished, and 12 (30%) were well nourished, (2) Of 112 mothers with a normal BMI, 60 (53.5%) were malnourished, and 52 (46.4%) were well nourished and (3) Of the 38 overweight mothers, 30 (78.9%) were malnourished, and 8 (21%) were well-nourished [Figure 5].

#### Association between Maternal Anaemia and CAN SCORE

Out of 200 newborns, 168 were born to anaemic mothers, and 32 were born to non-anaemic mothers. Using the CAN SCORE, malnutrition in babies born to anaemic mothers was more compared to babies born to non-anaemic mothers [108 (64.2%) vs 19(59%)]. This association has a moderate positive correlation, and it is statistically significant.

Other associations between CAN SCORE and maternal age and maternal parity were not found to be statistically significant.

## DISCUSSION

Low birth weight is a major public health problem in developing countries like India with high morbidity and mortality. Generally, newborn babies are classified as Appropriate for gestational age (AGA) and small for gestational age (SGA) in relation to gestational age. However, it is known that a birth weight of 2.5kg does not rule out fetal malnutrition, which is of clinical importance.

Fetal malnutrition (FM) contributes significantly to perinatal morbidity and mortality and indicates poor nutrition of the foetus while in the uterus. FM incidence worldwide is between 2% to 10% of the total births and is seen more in developed countries.<sup>[2]</sup> In India, the incidence of fetal malnutrition is not clearly defined; however, based on WHO criteria incidence of low birth weight (LBW) in India is around 30%, with 7-10 million infants born LBW annually. In developing countries like India, nearly 80% of all neonatal mortality is due to LBW and Intrauterine Growth Retardation (IUGR).<sup>[5]</sup>

Assessment of fetal nutrition status at birth is more important due to its effect on all major organs. FM should not be taken lightly as its immediate and long-term sequelae can lead to neonatal mortality. The clinical features of the FM depend on the time of insult and duration of the insult to the foetus. When the fetus is exposed to malnutrition during the early fetal period, they are more likely to have symmetric growth retardation i.e. weight, length and head circumference are equally affected; if exposed during late pregnancy, then the weight is more affected than height and head circumference. There are various methods used for the assessment of fetal malnutrition, which include anthropometric measurements and CANSCORE.

CANSCORE is a simple, bedside systematic method for identifying foetal malnutrition. Being a bedside test, it does not require any specialized equipment,

major calculation or laboratory investigation. Assessing foetal malnutrition by CANSORE is not time-consuming and can be done with minimal training. In our present study, we assessed and compared the CANSORE with various neonatal and maternal anthropometric parameters.

#### **Comparison of anthropometric measurements for nutritional assessment of newborns**

The results of the birth weight and length of newborns in our study when compared with the other studies showed similar results. Fetal malnutrition assessed by CANSORE was higher in our study (88%) when compared to other studies, where it varied between 10.9% to 54.58%.<sup>[3,10,15,16,19,22-24,26,27,33]</sup>

The incidence of SGA (38%) in our study was similar and was within the range (2.8% to 62.5%) when compared to other studies.<sup>[3,10,15,19,21,22,26,33]</sup>

Nutritional assessment by the ponderal index was found to be significantly high in our study (49.5%) when compared with other studies (range- 8% to 30.7%) on the higher side in our study when compared to other studies.<sup>[3,15,21,22,25-27,34]</sup>

Comparison of CANSORE with different parameters for nutritional assessment of newborns

On assessing fetal malnutrition in SGA & AGA babies by CANSORE, 53.2% AGA babies and 80.2% SGA babies were found to be malnourished. This was on the higher end when compared with other studies.(AGA varies from 5.53% to 31.8% and SGA from 23.2% to 100%).<sup>[3,15,21,22,26,33]</sup>

On comparing CANSORE with PI, it was seen that the CANSORE detects foetal malnutrition more significantly than Ponderal Index. In our study, we noted that 63.5% of foetal malnutrition was detected by CANSORE and 49.5% by PI. These results were similar across all other studies except in the study conducted by Almarzoki J M et al. & Liladhar et al., where PI was detected more than CANSORE (21.2% vs 17.5 % respectively).<sup>[3,15,21,22,25-27,34]</sup>

#### **Association of Fetal Malnutrition with Maternal Parameters**

In our study, (1) the correlation of maternal age with fetal malnutrition was not significant, (2) a statistically significant association was seen between foetal malnutrition and maternal anaemia and (3) foetal malnutrition was also noted in primigravidae and in babies born to mothers with low BMI, but their association was not statistically significant.

## **CONCLUSION**

#### **In this study, we observed that:**

1. The CANSORE has a statistically significant association with:

- Gestational age (p value-0.0009)
- Birth weight according to gestational age (p-value - 0.017)
- Neonatal BMI (p-value - 0.016)
- Ponderal index (p-value - 0.008).
- Maternal anaemia status (p-value- 0.0006).

2. Low mean birth weight, length & the high incidence of IUGR assessed through PI positively correlates with the fetal malnutrition assessed by CANSORE.

3. This study also reinforces that not all AGA babies are well nourished.

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