PREVALANCE OF FETAL UNDERNUTRITION IN NEONATES AND MATERNAL RISK FACTORS ASSOCIATED WITH IT IN COASTAL AREAS OF KARAIKAL.

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ABSTRACT

INTRODUCTION

Fetal undernutrition is a major public health problem in India. Fetal malnutrition or fetal undernutrition is defined as failure to acquire adequate quantum of fat and muscle mass during intrauterine growth. Poor maternal nutrition and placental insufficiency are the two main causes of fetal malnutrition Fetal undernutrition leads to morbidity in adulthood which in turn leads to fetal undernutrition of subsequent generation, it is a vicious cycle. CAN score is the gold standard method for identifying fetal undernutrition.

OBJECTIVE

To study the prevalence of fetal undernutrition in newborns babies born in VMMCH , Karaikal and maternal risk factors associated with it.

MATERIALS AND METHODS

A hospital based cross-sectional study conducted with 500 newborns and their mothers in Paediatrics department of VMMCH, Karaikal for a period of 18 months. All the eligible newborns were subjected to CAN score assessment and maternal details including obstetric, antenatal history, anthropometry and medical conditions were collected. Collected data was entered in Microsoft excel 2019 and converted it into SPSS version 2022 software, for statistical analysis.

RESULT

In this study of 500 newborns 240 babies(48%) were undernourished. Maternal factors like extreme ages(<22 and >35), maternal malnutrition, low spacing, irregular antenatal check-ups, poor socio-economic status were found to have an association with development of fetal undernutrition. Maternal medical conditions like PIH, overt DM, Thyroid disorders, Oligohydramnios, Anemia were identified a as risk factor for fetal undernutrition.

CONCLUSION

The prevalence of fetal undernutrition is higher in the study population compared to Indian average. There should be more Government initiated programs to address this issue. Most of the maternal risk factors can be reduced by improvement in the socioeconomic condition and good antenatal care.

KEY WORDS: fetal undernutrition, fetal malnutrition, CAN score, maternal risk factors, Clinical assessment of nutritional status, prevalence

INTRODUCTION

Fetal undernutrition is a major public health problem in India. Fetal malnutrition or fetal undernutrition is defined as failure to acquire adequate quantum of fat and muscle mass during intrauterine growth.[2,4] The concept of Fetal undernutrition was developed by Clifford in 1954 [5] and Scott and Usher coined the term "fetal malnutrition" [6,7]. Fetal undernutrition is associated with both immediate and long-term complications and mortality. According to the Fetal onset of adulthood diseases (FOAD) hypothesis proposed by Dr. David Barker undernutrition in prenatal period is associated with adulthood diseases like coronary artery disease, insulin resistance, obesity, hypertension etc.[9,10] Fetal undernutrition leads to morbidity in adulthood which in turn leads to fetal undernutrition of subsequent generation. As it is a vicious cycle it is important to break the cycle. So, it is important to identify malnourished neonates at the earliest so that we can intervene at the earliest and reduce the mortality and morbidity. Currently SGA, IUGR, LBW etc. are the terns used to identify undernourished newborns. But all those were ineffective in identifying the real burden of fetal undernutrition.

There are various methods such as birth weight criteria, intrauterine growth chart[3,9], and ponderal index , neonatal BMI, Kanawati index, CAN SCORE etc. to assess the fetal nutritional status[11-14]. The CAN score is considered as the gold standard method for identifying fetal undernutrition[14,16]. CAN score was developed by Jack Metcoff in 1994[1,2]. It is a bedside tool which assess the characteristic of hair and subcutaneous fat in various parts of body and a score of 0 to 4 assigned based on severity of fat loss. There is total 9 superficial parameters included in CAN score and the total score is 36 and a CAN score less than or equal to 24 is considered as fetal undernutrition.

There are many factors associated with fetal undernutrition. The main causes of fetal malnutrition are categorized into two: physiological and pathological[4,6,17]. This is again divided into fetal and maternal factors. Among maternal factors poor maternal nutrition and placental insufficiency are the two main causes of fetal malnutrition. Other causes include multiple pregnancy, maternal medical conditions like Pregnancy induced hypertension(PIH), uteroplacental insufficiency, infections etc[24]. Fetal factors include intrauterine infections, chromosomal anomalies, congenital disorders. Maternal risk factors are modifiable risk factors and if intervened early we can prevent fetal undernutrition to a greater extent. So, our study is aimed to find the prevalence of fetal undernutrition in newborns in Karaikal and the maternal factors associated with it.

OBJECTIVES

To study the prevalence of fetal undernutrition in newborns babies born in VMMCH , Karaikal

To study of maternal risk factors associated with cases detected as fetal undernutrition.

MATERIALS AND METHODS

Study design: Hospital based cross sectional study.

Study period: January 2021 to June 2022

Study duration: 18 months

Study place: Department of Paediatrics, Vinayaka Mission's Medical College and Hospital, Karaikal.

Study population: 500 newborns born in VMMCH, Karaikal with their mothers.

- Sampling technique:

    Purposive sampling of all consecutive cases.

- Sample size determination:

    All women who delivered in VMMC, Karaikal from 1st January, 2021 to 30th June 30, 2022 and those who fulfilled the eligibility criteria were included in this study. Hence, the sample size for the current study consisted of 500 mothers with their live singleton newborns.

INCLUSION CRITERIA

- Live born, singleton neonates of gestational age above 34 weeks delivered in VMMCH Karaikal
- Newborns with known gestational age by last menstrual period.

EXCLUSION CRITERIA

- Newborns whose parents are not willing for this study.
- Newborn with gestational age less than 34 weeks.
- Newborns with major congenital malformation and chromosomal defects
- Twins & other multiple gestations.
- Newborns born to mothers with unreliable estimation of gestational age.
- Newborns requiring NICU care.

METHODOLOGY

After getting approval from the institutional ethical committee and mothers informed written consent the general information and other details were entered into a standardized proforma. Soon after delivery, general information of babies was recorded and gestational age of the baby is confirmed by New Ballard`s Scoring and after applying inclusion and exclusion criteria newborns were enrolled into the study. Babies were then assessed by CAN score with in 24 hours of delivery and categorized into undernourished or well nourished. All these data were entered into Microsoft Excel sheet 2019 and then exported to SPSS (version 2022). The statistical analysis was carried out using SPSS. For all statistical tests, P value < 0.05 was considered as statistically significant.

RESULT

 In the study period of 18 months, total of 500 newborns were included to assess for fetal malnutrition. Birth weight of babies ranges from 1.50 to 4.00 kg with mean of 2.4852 + 0.315. Among 500 babies 267(53.4%) were female babies and the rest 233(46.6%) were male babies. 440(88%) out of 500 were term babies and 60(12%) were preterm babies. Small for appropriate babies were found to be 50(10%) out of 500 and the among the rest 10(2%) were

large for gestational age and 440(88%) were appropriate for gestational age babies. Based on CAN score assessment 240(48%) were found to be undernourished and 260(52%) were well nourished. The value of CANSCORE in newborn babies ranges from 13.0 to 36.0 with mean of 1.8.

Out of 500 babies, 20(4%) were born to mothers less 22 years of age, 170(34%) were born to mothers more than 35 years of age and remaining 310 (62%) were born to mother age between 22 to 35 years of age. The ages of mothers participated in this study ranges from 21 to 41 with a mean age 28.

170(34%) were primigravida mothers and 330(66%) were multigravidas. Among the 330 multigravidas 33(10%) were grand multiparas(more than or equal to 5 live births). Spacing between previous and current pregnancy was less than 2years for 158(47.8%) and more than 2years for remaining 172(52.1%). 70(14%) had irregular antenatal check-ups and remaining 430(86%) had regular antenatal check-ups. 230(46%)mothers belong to lower socioeconomic status according to modified Kuppuswamy`s scale and 270(54%) belongs to middle class.

Among 430 mothers who had regular antenatal check-ups 195(45.3%) BMI was <18.5 and the remaining 235(54.7%) and 180(41.9%) had a weight gain of >10 kg and rest 250(58.1%) had a weight gain of <10kg. Among the 500 mothers 70(14%) had oligohydramnios, 40(8%) had pregnancy induced hypertension, 85(42.5%) had gestational diabetes mellitus , 23(4.6%) had overt diabetes mellitus, 40(8%) had thyroid disorders, 50(10%) had anaemia, 10(2%) had seizure disorder , 20(4%) had bronchial asthma and 8(1.6%) had covid infection in either 1st or 2nd trimester. Out 500 newborns, 218(43.6%) babies were born to mother with no comorbid medical condition.

The mean age of mother with undernourished babies is found to be less when compared with mothers with well-nourished babies. The mean BMI of the mother with undernourished babies is less compared to those with well nourished babies. . The anthropometric measure of the mother also had significant impact on fetal undernutrition. The fetal undernutrition was observed to be more in mothers who had less pre pregnancy weight. Also, the average weight gain in the pregnancy in the mothers with fetal undernutrition was 7 kg, which was lower compared to mothers without fetal undernutrition which was 11.5kg with a p value of <0.0001. It is also found that , the fetal undernutrition was significantly higher in babies born to mothers who were less than 22 years and elderly mothers(>35 years). Fetal undernutrition was found to be more in babies of mothers who had irregular antenatal checkups. Less spacing between consecutive pregnancies also found to be have a higher chance of fetal undernutrition with a p value of<0.0001. Fetal undernutrition is more common in babies born to mothers belong to lower socio-economic class. Even though birth order was found to be a not significant; in babies born to grand multipara mothers found to have high incidence fetal undernutrition(60.6%) but the p value is not significant (0.1416).

The presence of the maternal complications like pregnancy induced hypertension (PIH), oligohydramnios, overt diabetes mellitus, thyroid disorders, anemia had significant impact in fetal undernutrition. PIH is found to be statistically highly significant with a p value of <0.0001 in the causation of fetal undernutrition. Oligohydramnios is also found to be an important risk factor for fetal undernutrition with a statistically significant p value of <0.0001. Overt diabetes and thyroid disorders were found to be statistically significant as a risk factor for fetal undernutrition with a p value of 0.0136 and 0.0248 respectively. Maternal

anemia is found to be of high statistical significance in causing fetal undernutrition with a p value of <0.0001. Disorders like gestational diabetes mellitus (GDM), seizure disorder, bronchial asthma and maternal covid infection are found to be not significant as a risk factor of fetal undernutrition.

DISCUSSION

In this cross-sectional study of 500 newborns, CAN score detected 240(48%) newborns as undernourished. According to our study 48% is the prevalence of fetal undernutrition which is comparable with the other studies conducted by Deodhar et al[15], Faheem et al[16], Soundarya[19] et al., Dhanorkar et al[20]., and Korkmaz A et al[18]. where the prevalence of fetal undernutrition ranges between 17.5% to 54.58%. As per other Indian studies the prevalence of fetal undernutrition ranges from 17.5 to 24% only, but in our study the prevalence is 48% which is much higher.

When compared with mothers of well-nourished babies; mothers of undernourished babies showed a mean difference in factors like age, pre-pregnancy weight, pre-pregnancy BMI, weight gain during pregnancy, regularity of antenatal check-ups, spacing between consecutive pregnancies and socioeconomic status. Fetal undernutrition is much more prevalent in mothers with extreme ages, low pre-pregnancy weight, low pre-pregnancy BMI, poor weight gain during pregnancy, irregular antenatal check-ups, less spacing between pregnancies and with low socio-economic status. The studies done by Adebami et al[17]., Skokic et al[21] and Poudel A et al[24]. showed similar results.

Maternal risk factors like pregnancy induced hypertension (PIH), oligohydramnios, overt diabetes mellitus, thyroid disorders, anemia had statistically significant impact on fetal undernutrition. The studies done by D Tesfa et al[23]., Adebami et al[17]., Poudel A et al[24]. showed similar results.

CONCLUSION

The prevalence of fetal undernutrition is found to be 48% in newborns born in VMMCH, Karaikal which is far higher than the Indian average of 18%. The maternal factors like extreme ages(<22 years and >35 years), maternal undernutrition(low pre-pregnancy weight and BMI, poor weight gain during pregnancy),irregular antenatal check-ups, low spacing between consecutive pregnancies, poor socio-economic status, and maternal medical conditions like PIH, overt DM, oligohydramnios, thyroid disorders, anemia had found to be risk factors for fetal undernutrition. This study suggests that how important it is to execute and monitor the effectiveness of programs initiated by Government to improve the adolescent and maternal health.

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TABLES & FIGURES

Table 1: Distribution of newborns.			
INDICES	CATEGORY	FREQUENCY	PERCENTAGE
Gender	Male	233	46.6%
	Female	267	53.4%
Gestational age	Preterm	60	12%
	Term	440	88%
Weight for GA	SGA	50	10%
	AGA	440	88%
	LGA	10	2%
Nutritional status	Undernourished	240	48%
	Well nourished	260	52%

Table 2: Comparison of maternal factors with fetal undernutrition.

Indices	Undernourished	Well nourished	P value
Age<22 years	80%	20%	**0.0017**
Age >22 years	42.7%	57.3%	
Age >35 years	38.2%	61.8%	**0.0017**
Age <35years	53%	47%	
Normal weight	20.1%	79.9%	**<0.0001**
Under weight	69.4%	30.6%	
BMI >18.5	75.9%	24.1%	**<0.0001**
BMI<18.5	13.6%	86.4%	
Weight gain <10kg	76.1%	23.9%	**<0.0001**
Weight gain >10kg	17.2%	82.8%	
Primigravida	47.1%	52.9%	0.7668
Multi gravida	48.5%	51.5%	
Grand multipara	60.6%	39.4%	0.1416
Multipara	47.1%	52.9%	
Irregular ANC	85.7%	14.3%	**<0.0001**
Regular ANC	41.9%	58.1%	
Lower SES	68.3%	31.7%	**<0.0001**
Upper SES	30.7%	69.3%	

Indices	Undernourished	Well nourished	P value
Table 3: Comparison of maternal medical condition fetal undernutrition			
Oligohydramnios	82.9%	17.1%	**<0.0001**
Non oligohydramnios	42.3%	57.7%	
PIH	82.5%	17.5%	**<0.0001**
Non PIH	45%	55%	
GDM	43.5%	56.5%	0.5140
Non DM	47.4%	52.6%	
Overt DM	73.9%	26.1%	**0.0136**
Non DM	47.4%	52.6%	
Thyroid d/o	65%	35%	**0.0248**
No thyroid d/o	46.5%	53.5%	
Anemia	100%	0%	**<0.0001**
Non anemic	42.2%	57.8%	
Seizure d/o	30%	70%	0.3975
No seizure	93.4%	6.6%	
Bronchial asthma	40%	60%	0.4671
Non asthmatic	48.3%	51.7%	
Covid	62.5%	37.5%	0.4095
No h/o Covid	47.8%	52.2%	