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Original research article

A study on the correlation of clinical and ultrasound diagnosis of IUGR

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Abstract

Introduction: Fetal growth restriction (FGR) is a term defined clinically as the failure of a fetus to achieve its genetically determined potential, going below two standard deviation or less than 10th percentile in gestationally matched weight measurements. It is very important to timely diagnose this condition for better perinatal outcome and management as fetal growth restriction is associated with adverse perinatal outcomes with many studies consistently showing 4-8 times increased morbidities and mortality. Many studies have consistently shown that FGR can lead to neonatal morbidities like respiratory difficulties, polycythemia, hypoglycemia, intraventricular haemorrhage and hypothermia at the time of birth.
Objective: To correlate clinical and ultrasound diagnosis of IUGR.
Methodology & Result: This study was conducted in the Department of Obstetrics and Gynaecology at a tertiary medical college, Bengaluru, during the period of Nov 2021 to Nov 2024, 3 years study. Total 100 cases were included in the study. Results: The prevalence of IUGR was found to be 33%. 60% of cases were in the age group 20-25 years. 88% of women belonged to rural areas. Sensitivity of ultrasonography is 80.8%, specificity is 87.8%, positive predictive value is 76% and negative predictive value is found to be 89%. Sensitivity of clinical methods is 73.1%, specificity is 73%. Sensitivity of doppler is 89.5%, specificity is 96%, positive predictive value is 89.5% and negative predictive value is found to be 96%.
Conclusion: The Doppler study is the best available modality for diagnosing FGR due to its high specificity, however clinical assessment, being a cost-effective screening tool, is equally good in diagnosing IUGR.
Keywords: IUGR, ultrasonography, doppler fetal growth restriction, clinical methods, symphysio-fundal height, abdominal girth, maternal weight gain

Introduction

IUGR refers to a condition in which a foetus is unable to grow to its genetically predetermined potential size. It is the major cause of perinatal morbidity and mortality in developing countries [1]. Low birth weight is a major problem in India. Nearly 3 million low birth weight babies are born annually in India [2, 3]. Of the various strategies that can be launched to combat this situation prevention of low birth weight by early diagnosis and its effective management is most important and desirable. The objective of study was to evaluate the validity of pregnancy.

Aim and Objectives

- The aim of our study was a clinic sonographic correlation of the following factors associated with Intrauterine Growth Restriction-
- The maternal and neonatal high-risk factors leading to IUGR.
- The various parameters like age, parity, BMI, social status, medical high-risk conditions associated with IUGR.
- Obstetric risk factors in relation to Intra uterine growth restriction.
- The Clinical and Sonographic (ultrasound/Doppler) correlation of IUGR.
- The neonatal morbidity and mortality associated with IUGR.

Material and Methods

This study was conducted in the Department of Obstetrics and Gynaecology at a tertiary medical college, Bengaluru, during the period of Nov 2021 to Nov 2024, 3 years study. Total 100 cases were included in

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the study. Approval for the study was obtained from ethical committee of the institute. Their relevant data such as IP number, maternal age, residential area, booking status, correct gestational age, parity, BMI, estimated foetal weight, ultrasound and doppler findings, mode of delivery was noted.

Result

Total admissions during the study period were 1400. 100 cases formed the study group. Overall there were 26 cases which were confirmed as FGR at birth. The prevalence of IUGR in our institution was found to be 33%. In our study 60% cases were in age group 20-25 years, 88% women belonged to rural area. 55% woman belonged to upper lower class as per modified Kuppuswamy socioeconomic scale. 60% cases were primigravida and 40% were multigravida, 70% were homemakers, 26% were labourer, and 4% were sedentary worker. 28% had hypertensive disorders of pregnancy, 8% had severe nutritional anemia, 3% had severe anemia with hypertensive disorder of pregnancy, 1% women had gestational DM and heart disease, 1% had sickle cell disease and TB. Oligohydramnios was present in 77%.

Table 1, shows the demographic distribution of cases. As per **table 2**, sensitivity of clinical methods is 73.1%, specificity is 73%.

Table 1: Demographic characteristics of study population

Variable		Frequency (N=245)	Percentage %
Age(Years)	<20	2	2
	20-25	60	60
	26-30	36	36
	>30	2	2
Locality	Rural	88	88
	Urban	12	12
Socioeconomic Status	Upper Class	1	1
	Upper Middle	1	1
	Lower Middle	30	30
	Upper Lower	55	55
	Lower	13	13

Table 2: Validity of clinically suspected FGR and FGR confirmed at birth

Parameters	FGR confirmed at birth		FGR not confirmed	
	N=26	%	N=74	%
FGR diagnosed on basis of clinical methods (symphysiofundal height, abdominalcircumference)	19	73.1%	20	27%
FGR not diagnosed by clinical methods	7	26.9%	54	73%

As per **table 3,** sensitivity of ultrasonography is 80.8%, specificity is 87.8%, positive predictive value is 76% and negative predictive value is found to be 89%.

Table 3: Validity of USG findings suggestive of FGR and FGR confirmed at birth

Parameters	FGR confirmed at birth		FGR not confirmed at birth	
	N=26	%	N=74	%
USG suggestive of FGR	21	80.8	9	12.2%
USG not suspected of FGR	5	19.2%	65	87.8%

As per **table 4**, sensitivity of doppler is 89.5%, specificity is 96%, positive predictive value is 89.5% and negative predictive value is found to be 96%.

Table 4: Validity of doppler changes suggestive of FGR and FGR confirmed at birth

Parameters	FGR confirmed at birth		FGR not confirmed at birth	
	N=26	%	N=74	%
Doppler changes present	17	89.5%	3	4%
Doppler changes absent	2	11.5	71	96%

Discussion

The prevalence of FGR in our institution was found to be 33% with 95% confidence interval limit (28%-40%) and with standard error of 0.04%. Out of 100 cases, 2% were in the age group of <20 years, 60% cases belonged to age group 20-25 year, 36% were in age group between 26-30 years and 2% were in age group >30 years. Similar results were found in study conducted by Marhatta N *et al*. who studied 247 cases and out of which maximum patients were in the age group of 19-25 years [4]. Present study is also consistent with study of Acharya D *et al*. [5]. In our study 89% belonged to rural area and 11% were from urban area. Kinare AS *et al*. in their study found fetal size to be smaller in rural Indian population than in

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urban Indian population [6]. As our institution is referral centre for rural areas and is located at outskirts, we receive majority patients from rural region. 57% were from upper lower class, 30% from lower middle class and 13% from lower class as per modified.
Kuppuswamy classification. Sinha S *et al*. studied 100 FGR cases and found that socioeconomically this population was in lower income category. Pillay *et al*., [4] also studied 321 cases and majority belonged to the lowersocioeconomic class. Sinha S *et al*. [6] studied 100 FGR cases and found similar results. 4 Out of 245 cases, 126 were clinically FGR suspected. 82 cases were confirmed to be FGR at birth. The sensitivity of clinical methods was found to be 70.74%, specificity 74.2%, positive predictive value 58%, negative predictive value 83.4%. Marhatta N *et al*. studied 247 cases, they found sensitivity to be 71% using SFH measurement, specificity 43%, negative predictive value 33%, positive predictive value 79%. They also found abdominal girth pattern in consistent with SFH.1 In study of 100 cases by Sinha S *et al*., symphysiofundal height was small for gestational age in 76% cases and was found to be a sensitive predictor of FGR [7]. Cnattingus S *et al*., reported that SFH measurement has a sensitivity of 100%, specificity of 92% and a negative predictive value of 100% [8]. Pillay P *et al*., found that the sensitivity of the gravidogram was 74.1%, specificity was 95.9%, positive predictive value was 78.4% and negative predictive value was 94.8% [9]. McDermott *et al*., estimated the average sensitivity of detecting FGR using SFH to be 65% with a false positive rate of 50% [9]. Jenson *et al*. [10] showed that SFH identified only 40% cases of FGR. Hamudu NA *et al*. [8] in their study concluded that SFH and abdominal girth could predict Birth weight more closely than gestational age. Strauss RS *et al*. [11] in their study concluded that maternal weight gain in pregnancy positively influences fetal growth and birth weight [12].
In our study sensitivity of clinical methods is 73.1%, specificity is 73%. Sensitivity of ultrasonography is 80.8%, specificity is 87.8%, positive predictive value is 76% and negative predictive value is found to be 89%. Sensitivity of doppler is 89.5%, specificity is 96%, positive predictive value is 89.5% and negative predictive value is found to be 96%.
86.8%. Pillay P *et al*. [1] also studied 321 cases and found sensitivity of 85.2%, specificity of 96.6% and positive predictive value of 3.6% and negative predictive value of 97%.6 Dr. Field *et al*. also found in his studies that fundal height measurement usually a routine part of prenatal care has a sensitivity of 70% for FGR [13]. Pearce showed that the sensitivity of the AC measurement (83%) was slightly better than that of the SFH measurement (76%), but this difference was not statistically significant. The results of above mentioned studies are comparable to our study. Maternal height, prepregnancy weight, and weight gain during pregnancy are found to be risk factors in our study whereas BMI did not show such correlation. In present study highest incidence of IUGR is associated with low maternal height and the association is consistent even with different studies.
In present study the highest incidence of IUGR was seen in maternal pre pregnancy weight <40 Kgs and least among if maternal pre pregnancy weight >50 Kgs.
ROC curve is showing comparison of area under curve for clinical, USG and doppler methods for prediction of IUGR. The analysis revealed that doppler is able to predict followed by USG and followed by clinical examination. It concludes that sensitivity doppler is highest followed by ultrasound followed by clinical methods. However, the results are comparable which concludes that clinical method could be used aseffective tool for diagnosis of IUGR.

Limitation: Present study is based on the observation of only 245 cases and is a part of ongoing intervention, therefore this needs concise interpretation. Lost to follow up both antenatally and at the time of delivery which was another challenge as perinatal outcome of lost cases could not be studied.

Clinical significance: Multiple meta-analysis have concluded that FGR is associated with four to eight fold increased risk of perinatal mortality and morbidity. It can have significant consequences in fetal, neonatal and adult life. So accurate and timely detection of growth restriction can prevent these adverse outcomes. Clinical assessment methods being cost effective tool plays a crucial role in diagnosing IUGR.

Conclusion

The efficacy of serial symphysio-fundal height measurement was found to be comparable with ultrasound in detection of IUGR. Hence maternal symphysis growth chart being a simple, inexpensive and sensitive screening test, its routine use should be emphasized for detection of IUGR in a developing country like India where health institutions with sophisticated technology are often inaccessible to majority of women. This method could also be taught to the paramedical personnel who can use this method to monitor foetal growth in the periphery so that cases of growth restriction can be referred early to tertiary level centers where they can benefit from more sophisticated diagnostic and therapeutic aids and good neonatal set up. It is a less cost-effective method and can be practiced more widely and does not require special training or expertise. Of the two methods studied for estimation of foetal weight, ultrasonographic method, i.e., Hadlock's formula has better predictable results in foetal weight estimation, compared to clinical method, i.e., Johnson's formula.
Although Doppler study has been found to be the best available modality for diagnosing FGR due to its

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high specificity however, clinical assessment is equally good in diagnosing the FGR. In limited resource settings, clinical assessment proves to be a simple, cost effective screening tool and establishes a good correlation with ultrasonographic modalities.

Recommendations-

1. We need to frame an ideal foetal growth chart in our country.
2. Symphysio-fundal height measurements plotted on customised growth charts are recommended as an initial screening tool for IUGR.

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