

A study on the correlation of clinical and ultrasound diagnosis of fetal growth restriction

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ABSTRACT

Background: Fetal growth restriction (FGR), a condition occurring due to various reasons, is an important cause of fetal and neonatal morbidity and mortality. It has been defined as a rate of fetal growth less than normal in light of the growth potential of that specific infant. These infants have many acute neonatal problems that include perinatal asphyxia, hypothermia, hypoglycemia, and polycythemia. The likely long-term complications are growth retardation and major and subtle neurodevelopmental handicaps. Adequate surveillance of fetal growth is a crucial factor. **Objective:** To correlate clinical and ultrasound diagnosis of fetal growth restriction. **Methodology:** This prospective study was conducted in the Department of Obstetrics and Gynaecology at NSCB medical college, Jabalpur during the period of March 2018 to August 2019. Total 288 cases were included in the study. **Results:** The prevalence of FGR was found to be 33.7%. 60.81% of cases were in the age group 20-25 years. 89% of women belonged to rural areas. 67.30% of women belonged to the upper-lower class. The sensitivity and specificity of clinical methods were found to be 70.7% and 74.2% respectively. The sensitivity of ultrasonography and Doppler was 80.5% and 90.2%, and specificity was found to be 87.7% and 95.1% respectively. Out of 126 clinically suspected IUGR cases, overall 82 cases (65.1%) were confirmed as IUGR at birth. 43(20.63%) were lost to follow-up. **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 FGR.

Keywords: Fetal growth restriction, clinical methods, symphysio-fundal height, abdominal girth, maternal weight gain, ultrasonography, doppler.

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 deviations or less than the 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 mortality¹⁻³. 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 birth¹⁻⁴. In the long term, neurological sequelae like cerebral palsy, developmental delay and behavioural dysfunction and in adult life hypertension, diabetes, obesity, coronary artery disease, stroke and metabolic syndrome can occur⁴. With the advent of diagnostic imaging and stringent antenatal care, it can be now increasingly diagnosed. Several factors maternal, fetal and placental can lead to FGR, the most commonly identified being the placental cause². If diagnosed early and managed properly perinatal outcomes can be improved.

The above discussion makes it obvious that timely diagnosis and management of FGR are associated with

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favourable outcomes. This makes a strong case for evidence-based standardized institutional protocols for objective surveillance of fetal growth during the intrauterine period. In developing countries like India, with the scarcity of resources, clinical examination and ultrasound assessment done regularly with proper documentation and clear instructions to patients can be immensely helpful. Our study focuses on this aspect on this aspect of clinical examination and ultrasonography assessment and its correlation for early diagnosis and management of FGR.

Materials and methods

This prospective study was conducted in the Department of Obstetrics and Gynaecology, NSCB Medical College and Hospital, Jabalpur from 1st March 2018 to 31st August 2019 after obtaining approval from the institutional ethical committee and informed consent from the study subjects.

Inclusion criteria included women presenting with a singleton pregnancy, longitudinal lie and 24 weeks of gestation onwards while excluding criteria were multiple pregnancies, polyhydramnios, transverse lie, doubtful gestational age (not confirmed either by LMP, non-availability of records of 1st trimester) and fetal congenital anomaly. Women attending ANC OPD were randomly selected to form the study group. Initially, 288 cases were in the study group; later 43 were lost to follow-up, hence 245 cases were studied.

A detailed history was taken, with special reference to obstetrics, menstrual, medical and family history. Gestational age was calculated from the last menstrual period and/or early ultrasound examination, followed by clinical and

and negative and positive predictive values of all methods were calculated and results were compared.

Results

Total admissions during the study period were 11369. 245 cases formed the study group. Overall there were 82 cases which were confirmed as FGR at birth. The prevalence of FGR in our institution was found to be 33.7%.

Table 1: Demographic characteristics of the study population

Variable	Frequency (N=245)	Percentage %
Age (years)	<20	0
	20-25	149
	26-30	92
	>30	04
Locality	Rural	218
	Urban	27
Socioeconomic status	Upper class	0
	Upper middle	0
	Lower middle	50
	Upper lower	165
	Lower	30

In our study, 60.81% of cases were in the age group 20-25 years, and 89% of women belonged to rural areas. 67.30% of women belonged to the upper lower class as per the modified Kuppaswamy socioeconomic scale. 59.60% of cases were primigravida and 40.40 % were multigravida, 65.7% were housewives, 30.6% were labourers, and 3.7% were sedentary workers.

33.1% had hypertensive disorders of pregnancy, 9% had severe nutritional anaemia, 2.4 % had severe anaemia with hypertensive disorder of pregnancy, 1.2% women had gestational DM and heart disease, and 0.8 % had sickle cell disease and TB. Oligohydramnios was present in 79.6%.

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

Parameters	FGR confirmed at birth		FGR not confirmed at birth	
	N=82	%	N=163	%
FGR is diagnosed based on clinical methods (symphysio-fundal height, abdominal circumference)	58	70.70%	42	25.80%
FGR not diagnosed by clinical methods	24	29.30%	121	74.20%

obstetric examinations. Maternal weight, symphysio-fundal height, and abdominal circumference were recorded on the first visit and monitored in subsequent visits. Later they were subjected to obstetric ultrasound and colour Doppler. Women in whom FGR was suspected clinically were followed up every fortnight and in whom not suspected, were followed up monthly. Hadlock’s formula was used on sonography for confirmation of FGR. At birth, the babies were examined. Their weight was noted. The clinical findings were then correlated with ultrasound findings to establish the diagnosis of FGR. All the data were recorded in structured proforma, entered in Microsoft Excel sheets and analyzed in SPSS20 software. The sensitivity, specificity,

Out of 82 confirmed FGR cases, 76.8% were live births, 13.4% were admitted to NICU and later succumbed to death and 9.8% were fresh stillbirth.

Table 1 shows the demographic distribution of cases. As per table 2, the sensitivity of clinical methods is 70.7%, specificity is 74.2%, positive predictive value is 58% and negative predictive value is found to be 83.4%.

As per table 3, the sensitivity of ultrasonography is 80.5%, specificity is 87.7%, positive predictive value is 76.7% and negative predictive value is found to be 89.9%.

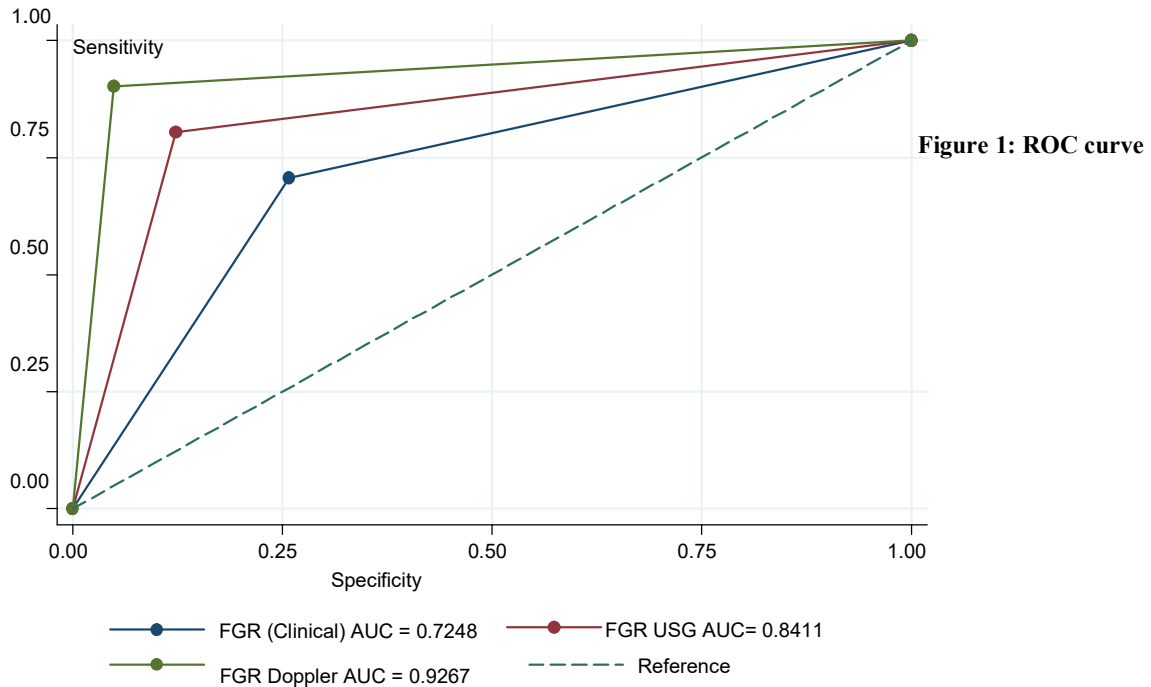


Table 3: Validity of USG findings suggestive of FGR and FGR confirmed at birth

Parameters	FGR confirmed at birth N=82		FGR not confirmed at birth N=163	
		%		%
USG suggestive of FGR	66	80.5%	20	12.3%
USG is not suspected of FGR	16	19.5%	143	87.7%

As per table 4, the sensitivity of doppler is 90.2%, specificity is 95.1%, positive predictive value is 90.2% and negative predictive value is found to be 95.1%.

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

Parameters	FGR confirmed at birth N=82		FGR not confirmed at birth N=163	
		%		%
Doppler changes present	74	90.2%	08	4.9%
Doppler changes absent	08	9.8%	155	95.1%

Discussion

The prevalence of FGR in our institution was found to be 33.7% with a 95% confidence interval limit (27.59% - 39.75%) and with a standard error of 0.03 %.

Out of 245 cases, 60.81% cases belonged to the age group 20-25 years, 37.5% were in the age group between 26-30 years and 1.6% were in the age group >30 years. Similar results were found in a study conducted by Marhatta N et al who studied 247 cases and out of which the maximum number of patients were in the age group of 19-25 years.¹ Present study is also consistent with a study by Acharya D et al.²

In our study, 89% belonged to rural areas and 11% were from urban areas. Kinare AS et al in their study found the fetal size to be smaller in rural Indian populations than in urban Indian populations.³ As our institution is a referral centre for rural areas and is located on the outskirts, we receive the majority of patients from rural regions.

67.3% were from an upper-lower class, 20.4% from the lower middle class and 12.2% from the lower class as per the modified Kuppaswamy classification. Sinha S et al studied 100 FGR cases and found that socioeconomically this population was in the lower income category.⁴ Pillay et al also studied 321 cases and the majority belonged to the lower socioeconomic class.⁶ Sinha S et al 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%, and 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%, and positive predictive value 79%. They also found abdominal girth patterns inconsistent with SFH.¹ In a study of 100 cases by Sinha S et al, symphysio-fundal height was small for gestational age in 76% of cases and was found to be a sensitive predictor of FGR.⁴ Cnattingus S et al, reported that SFH measurement has a sensitivity of 100%, specificity of 92% and a negative predictive value of 100%.⁵

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%.⁶ Mc Dermott 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 showed that SFH identified only 40 % of cases of FGR.⁸ Hamudu NA et al in their study concluded that SFH and abdominal girth could predict Birth weight more closely than gestational age.⁹ Strauss RS et al in their study concluded that maternal weight gain in pregnancy positively influences fetal growth and birth weight.¹⁰

In our study, the sensitivity of ultrasound in diagnosing FGR was 80.5%, specificity 87.7%, positive predictive value 76.7%, and negative predictive value 89.9%. Marhatta N et al studied 247 patients, the sensitivity of ultrasonically determined fetal AC was 75.7%, specificity 64.3%, positive predictive value 46.08% and negative predictive value 86.8%.¹ Pillay P et al also studied 321 cases and found a 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 their studies that fundal height measurement usually a routine part of prenatal care has a sensitivity of 70% for FGR.¹¹ 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.¹² The results of the above-mentioned studies are comparable to our study.

In our study, the sensitivity of Doppler was 90.2%, specificity 95.1%, positive predictive value 90.2%, and negative predictive value 95.1%. Marhatta N et al studied 247 patients and found the sensitivity of Doppler 82.9%, specificity 86.2%, positive predictive value 70.7% and

negative predictive value 92.6%.¹ Singh S et al in their study showed that UA RI was 84.6% sensitive and 82.9% specific in diagnosing FGR even at 30 weeks. Uterine artery PI had also good sensitivity, specificity of 79% and 76.9% respectively.⁴ Results are comparable to our study.

ROC curve is showing a comparison of the area under the curve for clinical, USG and Doppler methods for the prediction of FGR. The analysis revealed that Doppler can predict 92.67%, followed by USG (84.11%) and followed by clinical examination (72.48%). It concludes that the sensitivity of Doppler is highest followed by ultrasound followed by clinical methods. However, the results are comparable which concludes that the clinical method could be used as an effective tool for diagnosis of FGR.

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

Clinical significance - Multiple meta-analyses have concluded that FGR is associated with a 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 FGR.

Conclusion

Although the doppler study is the best available modality for diagnosing FGR due to its high specificity, however, clinical assessment is equally good in diagnosing FGR. In limited resource settings, clinical assessment proves to be a simple, cost-effective screening tool and establishes a good correlation with ultrasonographic modalities.

Conflict of interest: None. **Disclaimer:** Nil.

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