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Original Research Article

Study on the Relationship Between Clinical and Ultrasound Diagnosis of Fetal Growth Restriction

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Abstract:

Background: Fetal growth restriction (FGR) is a prevalent and intricate clinical issue that has a significant morbidity risk. Apart from congenital abnormalities and viral factors, FGR has been found to be a significant factor in perinatal death. This study aims to link the diagnosis of fetal growth limitation made by ultrasonography and clinical means.

Methods: This prospective study was carried out from May 2022 to January 2023 at the Department of Obstetrics and Gynecology at DMCH, Laheriasarai, Bihar. The study comprised a total of 288 patients.

Results: 33.7% of the participants were found to have FGR. The age group of 20–25 years old accounted for 60.81% of cases. 89 percent of women lived in rural areas. Women made up 67.30% of the upper-lower class. Clinical approaches were shown to have a sensitivity of 70.7% and a specificity of 74.2%, respectively. Doppler and ultrasonography were found to have sensitivity values of 80.5% and 90.2%, respectively, and specificity values of 87.7% and 95.1%. 82 cases (65.1%) out of 126 clinically suspected IUGR cases had IUGR verified at birth. Twenty-three (20.63%) were lost to follow-up.

Conclusion: Because of its high specificity, the Doppler study is the most effective modality currently available for identifying FGR; however, clinical assessment, a financially advantageous screening technique, is also a suitable way to diagnose FGR.

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

Introduction

A fetus that has not attained its full growth potential due to genetic or environmental causes is referred to as having fetal growth restriction (FGR), also known as intrauterine growth restriction (IUGR). The origin can be maternal, placental, or fetal, with notable overlap between these entities. Identifying the fetus that is growth restricted and assessing if it is at risk for growth restriction are two important aspects of prenatal treatment. Because these fetuses are more likely to have a poor postnatal outcome, this is significant. Furthermore, according to the Barker theory, FGR may have predated certain adult occurrences of hypertension, hyperlipidemia, coronary heart disease, and diabetes mellitus. In common obstetrical populations, prenatal screening for FGR include determining risk factors for reduced fetal development and measuring the fetus. A thorough sonographic evaluation of the fetus, placenta, and amniotic fluid comes after a clinical suspicion based on risk factors or physical examination. A weight below the 10th percentile for gestational age is the most widely used sonography-based definition of FGR, however other definitions using a range of criteria have been proposed. It might be challenging to differentiate between a little fetus that is growth restricted and one that is constitutionally small when a small fetus is found. Finding a fetus that is not tiny but has growth restrictions in relation to its genetic potential is similarly challenging. Though it's not always achievable, getting the right diagnosis is

crucial for prognosis and recurrence risk assessment.[1,2]

The detection of prenatal FGR should ideally offer the opportunity to apply medicines to reduce the morbidity and mortality associated with this problem. Fetal growth retardation (FGR) is associated with a higher likelihood of stillbirths; nevertheless, there is inadequate evidence to support the notion that early detection of FGR leads to better outcomes. Determining the population of growth-restricted fetuses at high risk of adverse outcomes, accurately identifying these kids in utero, and selecting interventions to improve outcomes remain challenging.

It is clear from the discussion above that prompt diagnosis and treatment of FGR are linked to positive results. This provides compelling evidence in favor of evidence-based, institutional standards that are standardized and allow for the objective monitoring of fetal growth during the intrauterine phase. With limited resources, clinical examinations and ultrasound assessments carried out on a regular basis along with appropriate documentation and patient instructions can be very beneficial in developing nations such as India. The clinical examination and ultrasonography evaluation aspects and their relationship to the early diagnosis and treatment of FGR are the main topics of our investigation.

Material and Methods

After receiving informed consent from the study subjects, this prospective study was carried out in the Department of Obstetrics and Gynecology at Darbhanga Medical College and Hospital in Laheriasarai, Bihar, from May 2022 to January 2023.

Women who presented with a singleton pregnancy, a longitudinal lie, and a gestational age of 24 weeks or more met the inclusion criteria; multiple pregnancies, polyhydramnios, transverse lies, uncertain gestational age (not confirmed by an LMP, lack of first trimester records), and fetal congenital anomalies met the exclusion criteria. The study group was formed by randomly selecting women who were receiving ANC OPD. There were 288 instances in the study group at first, but 43 were later lost to follow-up, leaving 245 cases to be examined.

A thorough medical history was obtained, paying particular attention to the patient's menstrual, obstetric, and family histories. After completing clinical and obstetric exams, gestational age was determined using the most recent menstrual cycle and/or an early ultrasound examination. Abdominal circumference, symphysio-fundal height, and maternal weight were measured at the initial visit and were tracked at further appointments. Afterwards, they had color Doppler and obstetric ultrasound.

Women with a clinical suspicion of FGR were monitored every two weeks, while those without a suspicion were monitored once a month. Sonography was utilized to confirm FGR using Hadlock's formula. The babies were checked at birth. They were weighed and noted. To confirm the diagnosis of FGR, the clinical and ultrasonography results were compared. Every piece of data was collected using organized proforma, input into Microsoft Excel spreadsheets, and then examined using SPSS 20 software. All of the approaches' sensitivity, specificity, negative and positive predictive values were computed, and the outcomes were contrasted.

Results

A total of 11369 admissions were made during the study period, and 245 patients made up the study group. In total, 82 instances had their status as FGR at birth confirmed. It was discovered that 33.7% of our institution's patients had FGR.

In our study, 89% of the women were from rural areas, and 60.81% of the cases were in the 20–25 age range.

According to the modified Kuppuswamy socioeconomic scale, 67.30% of women belonged to the upper bottom class. 65.7% of the patients were housewives, 30.6% were laborers, and 3.7% were sedentary workers. Of the cases, 59.60% were primigravida and 40.40 % were multigravida.

A total of 33.1% of pregnant women had hypertension disorders, 9% had severe nutritional anemia, 2.4% had severe anemia together with hypertensive disorders, 1.2% had gestational diabetes mellitus and heart disease, and 0.8% had sickle cell disease and tuberculosis. There was oligohydramnios in 79.6%.

Of the 82 confirmed cases of FGR, 76.8% were live births, 13.4% were admitted to the NICU and died there, and 9.8% were stillbirths that had just happened. The demographic distribution of cases is displayed in Table 1. Table 2 shows that the clinical approaches had a sensitivity of 70.7%, specificity of 74.2%, positive predictive value of 58%, and negative predictive value of 83.4%.

Table 1: Demographic characteristics of the study population

Variable		No. of cases (n=245)	Percentage
Age (years)	<20	0	0
	20-25	149	60.81%
	26-30	92	37.5%
	>30	04	1.60%

Locality	Rural	218	89%
	Urban	27	11%
Socioeconomic status	Upper class	0	0
	Upper middle	0	0
	Lower middle	50	20.40%
	Upper lower	165	67.30%
	Lower	30	12.20%

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

Parameters	FGR confirmed at birth		FGR not confirmed at birth	
	No. of cases (n=82)	Percentage	No. of cases (n=163)	Percentage
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%

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		FGR not confirmed at birth	
	No. of cases (n=82)	Percentage	No. of cases (n=163)	Percentage
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		FGR not confirmed at birth	
	No. of cases (n=82)	Percentage	No. of cases (n=163)	Percentage
Doppler changes present	74	90.2%	8	4.9%
Doppler changes absent	8	9.8%	155	95.1%

Discussion

With a standard error of 0.03% and a 95% confidence interval limit of 27.59% - 39.75%), the prevalence of FGR in our institution was determined to be 33.7%.

Of the 245 instances, 60.81% of the cases belonged to the 20–25 age group, 37.5% to the 26–30 age group, and 1.6% to the >30 age group.

Comparable findings were observed in a study by Marhatta N et al. that looked at 247 cases, the majority of which were individuals between the ages of 19 and 25.3. The current research aligns with a study conducted by Acharya D et al.[4]

Of the participants in our study, 89% were from rural and 11% were from urban areas. In their research, Kinare AS et al. discovered that compared to urban Indian communities, fetal sizes were smaller in rural Indian populations.[5] The bulk of our patients come from rural areas because our facility is a referral center for those areas and is situated on the outskirts.

According to the modified Kuppuswamy categorization, 67.3% of the population belonged to the upper-lower class, 20.4% to the lower middle class, and 12.2% to the lowest class. After analyzing 100 FGR cases, Sinha S et al. discovered that the population fell into the lowest income bracket socioeconomically.6 The bulk of the 321 cases that Pillay et al. examined belonged to the lowest socioeconomic class.8 Similar findings were made after Sinha S. et al. examined 100 FGR cases.[6]

126 of the 245 cases had clinical suspicions of FGR. It was determined that 82 patients were FGR from birth. Clinical approaches were determined to have a sensitivity of 70.74%, specificity of 74.2%, positive predictive value of 58%, and negative predictive value of 83.4%.

After analyzing 247 instances, Marhatta N. et al. discovered that the SFH measurement yielded a sensitivity of 71%, specificity of 43%, negative predictive value of 33%, and positive predictive value of 79%. Additionally, they discovered abdominal girth patterns that did not match SFH.[3] Symphysio-fundal height was small for gestational

age in 76% of the cases in a study of 100 cases by Sinha S et al., and it was discovered to be a sensitive predictor of FGR.[6] Cnattingus S et al, reported that SFH measurement has a sensitivity of 100%, specificity of 92% and a negative predictive value of 100%.[7] The gravidogram's sensitivity was determined to be 74.1%, specificity to be 95.9%, positive predictive value to be 78.4%, and negative predictive value to be 94.8% by Pillay P et al.[8] According to Mc Dermott et al., there is a 50% false positive rate and an average sensitivity of 65% when detecting FGR using SFH.[9,11] According to Jenson et al., only 40% of FGR patients were recognized by SFH.[10] In their research, Hamudu NA et al. found that belly circumference and SFH were better indicators of birth weight than gestational age.[11] According to Strauss RS et al.'s research, a mother's weight gain during pregnancy has a positive impact on the growth and birth weight of her fetus.[12] According to our research, ultrasound has an 80.5% sensitivity, 87.7% specificity, 76.7% positive predictive value, and 89.9% negative predictive value for FGR diagnosis. In a study of 247 patients, Marhatta N et al. found that the fetal AC detected by ultrasonography had a 75.7% sensitivity, 64.3% specificity, 46.08% positive predictive value, and 86.8% negative predictive value.[3] A sensitivity of 85.2%, specificity of 96.6%, positive predictive value of 3.6%, and negative predictive value of 97% were discovered by Pillay P et al. after studying 321 cases.8 In their research, Dr. Field and colleagues also discovered that the fundal height measurement which is typically a standard component of prenatal care has a 70% sensitivity for FGR.[13] Pearce demonstrated that while the sensitivity of the AC measurement (83%) was marginally higher than the SFH test (76%), there was no statistically significant difference between the two.[14, 15] Our study findings are similar to those of the previously cited studies. Doppler's sensitivity was 90.2%, specificity was 95.1%, positive predictive value was 90.2%, and negative predictive value was 95.1% in our investigation. Marhatta N et al showed that the Doppler sensitivity was 82.9%, specificity was 86.2%, the positive predictive value was 70.7%, and the negative predictive value was 92.6% after studying 247 patients.[3] In their study, Singh S et al. demonstrated that even at 30 weeks, UA RI was 82.9% specific and 84.6% sensitive in detecting FGR. Moreover, uterine artery PI demonstrated strong specificity and sensitivity (79% and 76.9%, respectively).[6]

Conclusion

Due to its high specificity, the doppler study is now the best method for identifying FGR; nevertheless, clinical assessment is also a viable way to diagnose FGR. Clinical assessment shows promise as a straightforward, economical screening method with strong correlation to ultrasonographic modalities in resource-constrained situations.

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