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"ANTENATAL ASSESSMENT OF INTRAUTERINE GROWTH RESTRICTION USING CLINICAL AND ULTRASONOGRAPHIC EVALUATION IN COMPARISON WITH POSTNATAL DIAGNOSIS"

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ABSTRACT:

Introduction: Identifying the factor (s) leading to IUGR and its management thus play an important role in reducing perinatal morbidity and mortality. Aim of the study is to assess intrauterine growth restriction in the antenatal period by clinical and ultrasound means.

Materials and methods:A hospital-based prospective observational study was conducted on 249 pregnant women attending the antenatal OPD in Sri manakula vinayagar Medical college and Hospital , Pondicherry from July 2022 to June 2023. Women in the first trimester with singleton pregnancies who gave informed consent were included, while those with polyhydramnios, fetal anomalies, diabetes, intrauterine death, uterine anomalies, and multiple pregnancies were excluded. Participants were followed at 24–28 weeks, 32–34 weeks, and term with counselling, history, clinical examination, and ultrasound with Doppler. Birth weight was taken as the reference standard. The validity of clinical methods, ultrasound, and Doppler was compared. Sensitivity, specificity, PPV, NPV, and diagnostic accuracy were calculated using Microsoft Excel 2010 and SPSS version 20.

Results: Most participants were aged 20–25 years (54.2%), with the majority residing in rural areas (72%). Symphysio fundal height demonstrated higher accuracy with sensitivity 88.6% and specificity 95.4%. It proved more reliable than fundal height for detecting IUGR ($p < 0.0001$).Ultrasound achieved sensitivity of 85% and specificity of 95.7%. It was found to be a highly accurate diagnostic method for IUGR ($p < 0.0001$).

Conclusion: Clinical assessment with Ultrasound and Doppler will improve the detection rate of IUGR and may lead to significant decline in perinatal mortality and morbidity .

KEYWORDS: Fetal growth restriction, Clinical methods, Symphysiofundal height, Abdominal girth, Ultrasound.

INTRODUCTION

Intrauterine growth restriction refers to a condition in which a fetus fail to achieve its genetically determined growth potential[1]. Earlier it was known as intrauterine growth retardation which was confused with mental growth retardation of the fetus, so the term has been replaced by fetal growth restriction[2].The current definition for low birth weight (LBW) is birth weight below 10th percentile for the gestational age .Neonates below the third percentile are very small for gestational age . Earlier although the term Small for Gestational age (SGA), Intrauterine Growth Restriction and Fetal Growth Restriction were used interchangeably (FGR)[3].

IUGR is observed in about 24% of newborns and affecting 30 million infants every year[4]. At national level the incidence of LBW is in the following order, Bangladesh (50%), India (28%), Pakistan (25%), Sri Lanka, Cambodia, Vietnam, Philippines, Indonesia and Malaysia[5]. Prevalance of LBW in India has been reported 26% with proportion of IUGR being 54%[4]. As reported by Neonatal Perinatal Database of India incidence of IUGR is 9.65% among hospital borne live borne infants. As reported by WHO collaborative study one of the reason for low birth weight is low weight of mother in the pre-pregnancy state and during pregnancy.[5]

All SGA babies are not pathologically affected whereas fetuses with IUGR are pathologically affected. FGR is a pathologic condition where the fetus is deprived of oxygen and nutrients, whereas approximately 40% of fetuses with a fetal size less than the 10th percentile are constitutionally small and healthy [6] . IUGR fetuses are at increased risk of perinatal mortality and morbidity. [4]

Although EFW is a crucial part of clinical decision making, the existing data have mixed opinion regarding differences in the best techniques to determine EFWs compared with birthweight (BW). The main methods in

modern practice to measure EFWs are fundal height measurements, Leopold's maneuver, and ultrasound.[7,8] Clinical examinations of maternal weight, symphysio fundal height and abdominal circumference are used for the diagnosis of Intrauterine Growth Restriction.[7]Serial ultrasounds are done to monitor fetal growth by measuring fetal biometry including biparietal diameter (BPD), Head circumference (HC), Abdominal circumference (AC), Femur length (FL*)*The degree of accuracy is also dependent on the actual fetal weight; there is a consistent tendency to overestimate or underestimate EFWs at the extremes of fetal weight.[9] There is also mixed evidence on maternal body mass index (BMI) and accuracy of Leopold's maneuver.[7,8] Despite these challenges in accurately calculating EFW, it remains a critical component of medical decision-making in obstetrics.

MATERIALS AND METHODS:

A hospital based prospective observational study was done on pregnant women who attended our antenatal OPD for dating scan at first trimester from 1st July 2022 to 30th June 2023 at sri manakula vinayagar medical college and Hospital,Pondicherry. 249 pregnant women were selected for the study .

Inclusion criteria included pregnant women of first trimester for dating scan and singleton pregnancies .Pregnancies with polyhydramnios, Fetal anomalies , Diabetes complicating pregnancies ,Intrauterine death ,Uterine anomaly and Multiple pregnancies were excluded.

Pregnant women who fulfilled the inclusion criteria with gestational age of 8-12 weeks for dating scan were included in the study. We selected cases from 1st July 2022 to 23 September 2023 as follow up till delivery had to be done. In all the cases thorough history, clinical examination with Symphysiofundal height measurement and routine obstetric examination was done. Basic investigations including anomaly scan was done at 18-20 weeks gestation in all cases . Total of 289 cases taken for study later 40 lost to follow up ,hence 249 cases were takenup for study.

Clinical assessment was done with Uterine fundal height after 12 weeks and Symphysio fundal height measurement from 24 weeks of gestation and Abdominal girth from 28 weeks of gestation .Ultrasound biometry using Hadlock formula was done from 24-28 weeks, again at 32-34 weeks of gestation and at term. In patients with suspected IUGR weekly follow up was done with ultrasound and doppler after 24- 28 weeks of gestation. In patients with suspected IUGR weekly follow up was done with ultrasound biometry and doppler (Umbilical artery, Middle cerebral artery) after 24- 28 weeks . RI, PI ,SD ratio and diastolic flow were considered to assess fetal status. In pregnant women with persistent non reassuring fetal status or abnormal Doppler were terminated before term following steroid therapy after proper counselling.

Outcome measures : Sensitivity, specificity, PPV and NPV, Diagnostic Accuracy were calculated to find the diagnostic value of clinical and ultrasound parameters in assessment of IUGR. Estimated fetal growth by clinical, sonographic analysis were compared with birth weight. No of preterm deliveries and oligohydramnios were assessed. Validity of clinical, Ultrasound, Doppler in diagnosing IUGR was assessed at the time of birth of the baby .

Statistical Analysis: Continuous data were presented in terms of Mean and standard deviation and analysed using students t test .Categorical data were presented as frequency and percentage,analysed using Chi square test or Fischers exact test . P value of less than 0.05 was considered statistically significant. Sensitivity, specificity, PPV and NPV, Diagnostic Accuracy were calculated to find the diagnostic value of clinical and ultrasound parameters in assessment of IUGR. All the calculations were done using Microsoft Excel 2010 and SPSS version 20.

RESULTS

TABLE 1: SOCIODEMOGRAPHIC PROFILE OF THE PARTICIPANTS

VARIABLE		Frequency	Percentage
Age(years)	<20	2	0.8%
	20-25	135	54.2%
	26-30	100	40%
	>30	12	4.8%
Locality	Rural	180	72%
	Urban	69	28%
Socioeconomic status	Upper class	2	0.8%
	Upper middle	11	4.41%
	Lower middle	22	8.83%
	Upper lower	60	24.09%
	Lower	154	61.8%

Most participants were aged 20–25 years (54.2%), with the majority residing in rural areas (72%). Socioeconomically, 61.8% belonged to the lower class, followed by 24.1% in the upper-lower class.(Table 1)

TABLE 2: DIAGNOSIS OF IUGR BY FUNDAL HEIGHT

By Fundal height	BIRTH WEIGHT (IUGR)	BIRTH WEIGHT (NORMAL)	TOTAL	P value
IUGR	43	15	58	<0.001
NORMAL	17	174	191	
TOTAL	60	189	249	
STATISTICS				
Sensitivity		71.6%		
Specificity		92.06%		
Positive predictive value		74.1%		
Negative predictive value		91.09%		

From above findings it was found Fundal height had a sensitivity of 71.6% and specificity of 92.06% in diagnosing IUGR. Although useful, it showed moderate sensitivity with significant association ($p < 0.001$).

TABLE 3: DIAGNOSIS OF IUGR BY SYMPHYSIOFUNDAL HEIGHT

By SFH	BIRTHWEIGHT (IUGR)	BIRTHWEIGHT (NORMAL)	TOTAL	P VALUE
IUGR	62	8	70	<0.0001
NORMAL	10	169	179	
TOTAL	72	177	249	
STATISTIC		VALUE		
Sensitivity		88.6%		
Specificity		95.4%		
Positive predictive value		87.03%		
Negative predictive value		96.6%		

Symphysiofundal height demonstrated higher accuracy with sensitivity 88.6% and specificity 95.4%. It proved more reliable than fundal height for detecting IUGR ($p < 0.0001$).

TABLE 4: DIAGNOSIS OF IUGR BY ABDOMINAL GIRTH

GROUP	BIRTHWEIGHT (IUGR)	BIRTHWEIGHT (NORMAL)	TOTAL	P VALUE
IUGR	44	14	58	<0.0001
NORMAL	16	175	191	
TOTAL	60	189	249	
STATISTICS		VALUE		
Sensitivity		73.33%		
Specificity		92.5%		
Positive Predictive Value		75.8%		
Negative Predictive Value		91.6%		

Table 4 depicts Abdominal girth with sensitivity of 73.3% and specificity of 92.5%. While fairly specific, it was less sensitive compared to SFH and ultrasound ($p < 0.0001$).

TABLE 5: DIAGNOSIS OF IUGR BY CLINICAL METHOD

GROUP	BIRTHWEIGHT (IUGR)	BIRTHWEIGHT (NORMAL)	TOTAL	P VALUE	
IUGR	44	14	58	<0.0001	
NORMAL	16	175	191		
TOTAL	60	189	249		
STATISTIC		VALUE			
Sensitivity		73.33%			
Specificity		92.5%			
Positive Predictive Value		75.8%			

Negative Predictive Value	91.6%		

Clinical methods overall provided reasonable specificity but variable sensitivity. They remain valuable limited settings as initial screening tools in resource- Table 5

TABLE 6: DIAGNOSIS OF IUGR BY ULTRASOUND

Table 6 depicts regarding ultrasound with sensitivity of 85% and specificity of 95.7%. It was found to be a

GROUP	BIRTHWEIGHT (IUGR)	BIRTHWEIGHT (NORMAL)	TOTAL	P VALUE
IUGR	51	8	59	<0.0001
NORMAL	9	181	190	
TOTAL	60	189	249	

STATISTIC	VALUE
Sensitivity	85
Specificity	95.7%
Positive Predictive Value	86.4%
Negative Predictive Value	95.2%

highly accurate diagnostic method for IUGR ($p < 0.0001$).

TABLE 7: DIAGNOSIS OF IUGR BY CLINICAL ASSESSMENT AND ULTRASOUND

GROUP	BIRTHWEIGHT (IUGR)	BIRTHWEIGHT (NORMAL)	TOTAL	P VALUE
IUGR	47	7	54	<0.0001
NORMAL	6	171	177	
TOTAL	53	178	231	

STATISTIC	VALUE
Sensitivity	88.6%
Specificity	96.0%
Positive Predictive Value	87.03%
Negative Predictive Value	96.6%

From Table 7 it was found that combined clinical assessment with ultrasound showed the best performance with sensitivity 88.6% and specificity 96%. This approach provided the highest diagnostic accuracy for IUGR ($p < 0.0001$).

DISCUSSION

In this study 68.33% of pregnant women with IUGR had BMI between 18.5 to 24.9 . Study by Manandhar *et al*[10] had 60% of pregnant women with BMI between 18.5 to 24.9.As prevalence of hypertensive disorders and anaemia are common in Assam, rather than malnutrition it could be the cause for IUGR in patients with normal BMI. Majority of pregnant women with IUGR i.e 63.3% belonged to primigravida. It is similar to other studies like Dr.Ashis Seal *et al*[11]. (2019) (72%) belonged to primigravida. Muniyar *et al*[12]. (2017) (53%) belonged to primigravida and in Muhammad *et al*[13] (50.5%), Surve *et al*[14](2019) (50.8%).

In this study 65% of IUGR patients had preterm birth and 33.8% of IUGR patients were associated with oligohydramnios and 20.79% of normal patients were associated with oligohydramnios. This finding is comparable to study conducted by muniyar [15]and Ashish seal et al[14].These findings indicate complications associated with IUGR during antenatal period and immediate delivery.

Research findings in this study including clinical methods and ultrasound showed better prediction in diagnosing IUGR which were comparable to few studies like Sinha S *et al*[15] that showed 76% of cases had IUGR and SFH was found to be sensitive predictor. Study done by Pillay *et al*.[16]showed almost similar predictive results. Cnattingus S *et al*[17] analysed and reported that SFH measurement had btter prediction among clinical methods. Few studies like Parul Shukla *et al*[18]%. Maharatta *et al*[19] .Pearce *et al*[20] reported almost similar findinngs in terms of measurement of fetal weight by clinical or ultrasound methods.

Though clinical methods or ultrasound findings showed better prediction when measured by each methods separately ,Combined clinical methods and ultrasound in combination showed sensitivity of 88.6%, specificity of 96.0%, PPV of 87.03%, NPV of 96.6% which had higher prediction than when used individually.So

combined clinical and ultrasound methods proves to be better predictor of IUGR though it has not reached to 100%. This is comparable to the study done by Gangadhar *et al*[21] , Marhatta *et al*[19] with clinical assessment and ultrasound in combination showedcomparable results.Difference in result when compared to the study by Marhatta *et al* [19]might be due to interobserver variation and difference in patients race and built.

Strength of this study relies in its attempt in estimating accuracy of diagnosis of FGR as FGR remains a challenge in the context of accurately estimating fetal weight. Still underestimation and overestimation of estimated fetal weight persists and needs further research in improving the modality and accuracyof diagnosis.FGR is a condition which may have impact on all stages of life So early detection of IUGR and proper education to patients is the crucial step to reduce the impact in present pregnancy and in preventing IUGR in future pregnancies. So this study has delivered the importance of regular followup with clinical as well as ultrasound examination to reduce fetal mortality as well as morbidity.This study has estimated the accuracy of each modality by clinical and ultrasound means in diagnosing IUGR but has a drawback of not researching further new methods or methods in improvising current methods which may have accurate prection of 100% in near future.So this study may remain as a tool for future further research in improvising better predictive methods in diagnosing IUGR.Only 249 women have been analysed in this study .Further studies on large population including large sectar from various dispersed places can give much more better analysis .

CONCLUSION:

Prevention and early detection of IUGR and treatment may lead to huge decline in perinatal mortality and morbidity. Regular antenatal checkup is mandatory to reduce IUGR . In our study Combination of clinical assessment with ultrasound and doppler proves to be the best modality for diagnosing IUGR. In developing countries like India with poor resources, clinical assessment can be used to diagnose IUGR. Though it has less sensitivity compared to ultrasound in our study, specificity, PPV and NPV of the clinical method is appreciable. As it is simple, inexpensive it will be of major help in Peripheral health centres. However wherever ultrasound facility is available combination of clinical assessment with ultrasound will improve the detection rate of IUGR and perinatal outcome. Further research and techniques are needed to further improve the detection rate and prevent sequaele related to it.

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