Intrauterine Growth Restriction: Antenatal Diagnosis and Foetal Outcome

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The following study was conducted in the department of obstetrics and gynaecology Jinnah hospital Lahore to identify women with risk factors for IUGR (Intrauterine growth restriction: Antenatal diagnosis and foetal outcome.)on clinical assessment and ultrasound and to co -relate antenatal diagnosis with fetal outcome. Fifty (50) patients were picked on basis of risk factor. Fourteen (28%) had SFH less than expected for gestation. Eleven (22%) had hypertension, Nine (18%) had previous history of SGA babies. Other risk factors were diabetes mellitus, pre-pregnancy weight less than 50 kg and smoking. On ultrasound 18 (39.63%) of patients were diagnosed as IUGR while 28 (60.48%) were diagnosed as non IUGR. Among IUGR babies 66.24% had asymmetrical while 33.76% had symmetrical IUGR. 39.53% babies were suspected of IUGR on SFH, and 28% of IUGR babies were suspected on ultrasound, as outcome measure 25% of babies had birth weight less than 10th percentile after delivery. It was concluded that for antenatal diagnosis of IUGR sonographic assessment is more precise than clinical assessment.
Key words: Intrauterine growth restriction, foetal outcome, antenatal diagnosis

IUGR is defined as an infant having birth weight below the 10th percentile for gestation. Antenatal diagnosis of IUGR is usually difficult [1] as only a minority of patients have obvious clinical symptoms.[2] Various methods have been used for antenatal diagnosis of IUGR such as measurement of fundal height,[3] identification of risk factors that correlate with IUGR,[4] biochemical [5] and biophysical methods.[6] Each method has its own limitations and errors.

A low symphysis fundal height, PIH, weight loss or no weight gain, smoking during pregnancy, low pre-pregnancy weight and a previous small for gestational age baby have been described as important risk factors.[7]

Accurate assessment of gestational age is very important. Adjustments in baby's weight due to variables like maternal height, weight, race, age, birth order and fetal sex should be kept in mind.

Serial symphysis fundal height measurements clinically contribute to our ability to diagnose and evaluate IUGR fetus.[8] When growth restriction is suspected on clinical grounds, then serial ultrasound is used as an adjuvant to clinical assessment. Causes and risk factors should be identified in such patients.

Multiple sonographic parameters are used to improve diagnosis of IUGR. The parameters used are BPD, AC, FL, HC, amniotic fluid volume and sonographic estimated fetal weight. After delivery the weight of each baby was recorded and checked on charts for babies weighing less than 10th percentile for gestation.)

Measurement of fundal height and ultrasound diagnosis of IUGR is inexpensive, time saving, non invasive with no known side effects and its efficacy is accepted all over the world.

Materials and methods:

The study was carried out for 10 months (Oct 2000 to Sep 2001).The study population consisted of all the pregnant women coming for antenatal visits to Gynae Unit I Jinnah Hospital Lahore. Out of this study population 50 consecutive patients with singleton gestation who were suspected of having IUGR on clinical basis (fundal height smaller than dates) were included in the study. Also included in the study were patients with risk factors for IUGR i.e. pregnant mothers who had a previous SGA fetus, who were of low pre-pregnancy weight (< 50 kg), who had a medical condition such as PIH, diabetes, antiphospholipid syndrome, or who gave a history of eating disorders or persistent hyperemesis. Exclusion criteria were mothers with multiple pregnancy, babies with congenital anomalies and mistaken dates.

The patients were booked and baseline evaluation was done. The risk factors were identified. Detailed history was taken and examination done at booking visit. Patients were weighed. Blood pressure was recorded and routine antenatal investigations were done of each patient. The patients included in the study were managed individually for any problem during the antenatal, intrapartum or postpartum periods.

The measurement of distance between the upper rim of symphysis pubis and uterine fundus were taken along the longitudinal axis of uterus with patient lying supine, with flexed legs, empty bladder and flexible measuring tape in contact with abdominal wall. Patients with fundal height less than 3 cm than expected were included in the study.

The patients were followed monthly upto28 weeks of gestation, fortnightly till 36 weeks of gestation and weekly until delivery. In addition to routine follow up, according to individual case patients were called as frequently as required and admitted if inpatient care was needed.

At least 3 ultrasound examinations were performed for each case of suspected IUGR. An initial ultrasound examination was performed to confirm gestational age. If subsequent AC measurement were below the 10th percentile the case was classified as suspected IUGR. In

ultrasound the following parameters were studied; BPD, A/C, FL, quantitative amniotic fluid volume and estimated fetal weight. The IUGR cases were followed by serial ultrasound scans (fortnightly) till term and more frequent scans were repeated when indicated.

Quantitative amniotic fluid volume was coded as normal if any pockets exceeded 3 cm vertical dimension. Oligohydramnios was defined as the absence of a vertical pocket of amniotic fluid over 2 cm. Each fetus was also screened for gross fetal anomaly. Fetal movements and fetal cardiac activity were identified. Placenta was localized and graded. After delivery babies were weighed and diagnosis of IUGR confirmed. The actual number of babies who had weight less than the 10^{th} percentile for respective gestational age were compared with the cases picked on antenatal examination.

Results:

Out of 50 patients included in the study, the distribution of patients according to risk factors is as following: 14 patients had symphysis fundal height less (28%) than 3 cm than expected date of confinement. 11 (22%) patients had pregnancy induced hypertension.

Patients with previous history of small for gestational age baby were 9 (18%). Patients with history of eating disorders/ persistent hyperemesis during pregnancy were 6 (12%). Patients with pre-pregnancy weight less than 50 kg were 5 (10%). Patients with gestational diabetes were 4 (8%) and 1 patient was smoker (2%).

The patients were booked and ultrasound examination of each patient was done at booking visit. It was repeated in 2^{nd} and 3^{rd} trimesters, and for each individual case according to requirement.

EDD was calculated on basis of booking ultrasound and any discrepancy noted compared with date of LMP. Where discrepancy was more than 3 weeks, dating was based on first trimester ultrasound. On ultrasound examination of patients, the following parameters were noted, crown rump length when gestation was les than 12 weeks. When gestation was greater than 12 weeks, the biparital diameter, head circumference, AC, FL, amount of liquor, sonographic estimated fetal weight were recorded.

Among 50 patients, who were booked 4 were lost of follow-up on subsequent antenatal visits.

Out of 46 patients, 18 (39.52%) patients were diagnosed as IUGR on ultrasound examination while 28 (60.48%) patients were diagnosed as non IUGR. In this group 15 (55%) of patients had mistaken dates. 9 (30.4%) patients gave history of irregular cycles. While 4 (14.6%) had variable lie.

On basis of various sonographic parameters the IUGR group was evaluated for type of IUGR. 12 (66.24%) fetuses had asymmetrical IUGR, and 3 (24.32%) had normal amount of liquor while 9 (75.65%) had decreased liquor i.e. oligohydramnios. 6 (33.76%) fetuses had symmetrical IUGR, 2 (38.35%) had normal amount of liquor while 4 (61.65%) had oligohydramnios.

After collection of antenatal data, patients were followed till delivery and after delivery babies were weighed. The weight of the baby was compared with charts for weight according to gestational age and it was determined whether babies were appropriate, small or large for gestational age.

Comparison was made between babies diagnosed antenatally because of decreased fundal height and birth weight. 25% of babies had birth weight less than 10^{th} percentile after birth as compared to 39.63% detected clinically.

When comparison was made between ultrasound diagnosis and birth weight. It was observed that for 12 (25%) IUGR cases, 13 (28%) were detected on ultrasound antenatal examinations. Simple frequency tables were made for all these observations.

Cross tabulations were made between fundal height and birth weight and ultrasound diagnosis and birth weight. Chi square test was applied.

It was concluded that clinically assessed mothers with appropriate fundal heights have normal weight babies as compared to those whose fundal heights were less than that for gestational age. Ultrasonographically assessed appropriate for gestational age fetuses are significantly more often normal birth weight babies as compared to those who had features of IUGR. From the results it is clear that although clinical examination and ultrasound assessment antenatally are good predictors of IUGR, the diagnostic significance and sensitivity of ultrasound assessment is superior than symphysis fundal height.

Table 1: Risk factors of IUGR (n=50)

Causes	=n	%age
SFH less than 3 cm	14	28
PIH	11	22
Previous H/o SGA baby	09	18
H/o Eating disorders/ persis hyperemesis	06	12
Pre-pregnancy weight less than 40kg	05	10
Diabetes mellitus	04	08
Smoking	01	02

Table II: Ultrasound assessment (n=46)

Assessment	=n	%age
U/S diagnosed IU GR	18	39.52
U/S diagnosed non-IUGR	28	60.48

U/S:Ultrasound, IUGR:Intra-uterine Growth Restriction

Table III: Non intrauterine growth restriction cases (n=28)

Cases	=n	%age
Mistaken dates	15	55%
Irregular cycle	09	30.4%
Variable lie	04	14.6%

Table IV: Comparison of symphysis fundal height with fetal outcome (n=46)

Cases	Appropriate for gestational age		Below the 10th Percentile	
	n=	%age	n=	%age
Fundal height	28	60%	18	39.63
Birth weight	34	75%	12	25%

Table V: Comparison of Ultrasound measurement with fetal outcome (birth weight)

Cases	Appropriate for gestational age		Below the 10th Percentile	
	n=	%age	n=	%age
Ultrasound assessment	33	72%	13	28%
Birth weight	34	75%	12	25%

Discussion:

The small study carried out on IUGR supports the fact that IUGR is a multifactorial disease and its prediction can be made in antenatal period with good precision by clinical and ultrasound examination. The study was carried out on 50 pregnant patients coming to obstetrical outpatient department. Results from the present study corroborate and reinforce the results of local and foreign studies on the same subject.

In the study out of 50 patients who were booked 4 were lost of follow-up during subsequent antenatal visits. These patients were picked on basis of risk factor for IUGR and clinical examination. 14 (28%) of patients has SFH less than 3 cm then EDD. 11 (22%) had PIH, 4 (8%) were diabetic, 9 (18%) had previous history of SGA baby, 5 (10%) had pre-pregnancy weight less than 50 kg. 6 (12%) had eating problems like persistent hyperemesis. While 1 (2%) of patients were smokers.

Symphysis fundal height have been constructed and used by many authors and it is considered as an acceptable methd for screening. Serial symphysis fundal height provide an improvement in prediction of SGA infants.

SFH curves predict IGUR in about 25-60% of cases. Similar observation have been made by Neilson and Varkyl. On the other hand Lindhard did not find it helpful.

According to Norris LA [9] in 29 patients of IUGR 14 were complicated by hypertension while 15 were normotensive through out their pregnancy.

According to Tenovon-A et al and Hassan MM et al [7] the children of smoking mothers are smaller than those of non-smoking mothers.

Every year out of the 30 million newborns with IUGR 75% are born in Asia, mainly in South Central Asia.[10] Ramabingaswami pointed out that the key to this deadlock is the women of a country.[11] Around 60% of females in South Asia have iron deficiency anemia.

The pregnancy weight gain in South Asia is 5 kg. According to a community based study in Karachi, the incidence of term IUGR is 24.4%. The major risk factors are low maternal weight, grand multiparity, low level of education, consanguinity and short birth to conception interval.[12]A comparable study in Ahmedabad India showed similar results.[13] Still another study in India concluded maternal malnutrition as a risk factor for IUGR with an attributable risk of 42%.[14]

In our study on basis of ultrasound parameters 18 patients (39.52%) were suspected as having IUGR while 28 patients (60.48%) were diagnosed as non IUGR. Among the non-IUGR 15 patients (55%) had mistaken dates.

Gestational age should be as signed at the time of first sonogram during pregnancy.[15] First trimester dating is very reliable. It should be compared with LMP of patient and if there is discrepancy of more than 3 weeks that first trimester dated ultrasound EDD should be used as a reference. Where the BPD/ FAC ratio was increased, those patients were diagnosed as asymmetrical IUGR.

In our study 12 (66.24%) patients had asymmetrical IUGR while 6 patients (33.76%) had symmetrical IUGR.

The results of this study are comparable with results of published studies. According to Lyndon M Hall et al,[16] out of 101 fetus studied 65.3% were considered growth retarded whereas 34.7% were AGA. According to Chamber Lin et al[17] out of 147 clinically suspected cases 56 were confirmed as IUGR while 91 were non IUGR. IUGR associated with oligohydramniosis has extremely poor fetal outcome.

The clinically suspected IUGR were assessed by the following ultrasound parameters, BPD, FL, FAC, FHC, amniotic fluid volume and SEFW. It is concluded that ultrasonography is a powerful tool for antenatal diagnosis of IUGR.

In local study using SFG, 10 cases were screened for IUGR. While on ultrasonography 13 cases were suspected of having AC below 10th percentile. At birth 9 cases were confirmed of having weight below 10th percentile, thus giving sensitivity of 90% and specificity of 96% to SFH and 69% and 85% to AC.[55]

When comparison was made between patients who were suspected of having IUGR because of decreased fundal height on clinical examination and birth weight 25% of babies had birth weight less than 10th percentile as compared to 39.63% detected cinically. In comparison of ultrasound measurement with birth weight 28% patients were detected as IUGR and 25% of babies after delivery had IUGR.

It was concluded that although both SFH measurement and ultrasound assessment of IUGR are significant, results of our study show that ultrasound is more statistically significant. Ultrasound remains the best method for the diagnosis, characterization and follow-up of IUGR.

The ultrasound measurement of abdominal circumference has been regarded as the most reliable fetal

measurement for prenatal diagnosis of IUGR especially when it is used to diagnose symmetrical IUGR.

According to Chin-Chu Lin [18] the sensitivity is 87.5%. According to Peter M the sensitivity is 82% while according to local study it is 78.7%.

The results of this small study have proved that SFH can be used as a screening test for IUGR. This is even more important in developing countries like Pakistan where the hospitals are minimally equipped and institutes having the advanced technology are inaccessible for most patients. This simple, inexpensive and useful method should be used at all levels (primary, secondary and tertiary) to identify patients with a high risk of IUGR.

These can then be referred to advanced health care centers where they can be benefited from more sophisticated diagnostic facilities.

IUGR represents a major risk to the fetus and a dilemma for the obstetrician. Appropriate management involves making a diagnosis of IUGR, defining the underlying risk factors and aetiology, accurately assessing fetus and subsequently planning the most appropriate form of surveillance and delivery.

It is concluded that combined SFH and ultrasound measurements are a powerful tool for antenatal diagnosis of IUGR.

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