VALUE OF INTRAUTERINE PONDERAL INDEX IN THE PREDICTION OF INTRAUTERINE GROWTH RETARDATION IN HIGH RISK PREGNANCIES AND ITS CORRELATION WITH PERINATAL OUTCOME

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SUMMARY

A prospective, randomised well controlled study was conducted on 60 pregnant patients to evaluate the predictive efficacy of intrauterine ponderal index in high risk pregnancies and to correlate it with perinatal outcome. These patients were divided into two groups, Group I (Study group) consisted of 30 high risk patients and Group II (Control group) comprised of another 30 patients with normal uncomplicated pregnancies. In group I, 22 patients had normal intrauterine ponderal index whereas in 7 patients the intrauterine ponderal index was below the 10th percentile and in one patient it was above 90th percentile. In group II all patients had normal intrauterine ponderal index and all patients had normal perinatal outcome. The prognostic efficacy of intrauterine ponderal index to detect intrauterine growth retardation, in the study group was found to have a sensitivity of 54.5%, specificity of 95%, positive and negative predictive value of 85.7% and 78.2% respectively. Group I, two sub-groups were identified, one with low and other with normal intrauterine ponderal index. In this group antenatal, intranatal and neonatal complications were higher in patients with low intrauterine ponderal index than in patients with normal ponderal index. Routine antenatal and intranatal care was adequate in patients of normal intrauterine ponderal

index. In patients with low intrauterine ponderal index however, extensive fetal monitoring in the antenatal and intranatal period was necessary in order to improve perinatal outcome.

INTRODUCTION

High risk pregnancies are associated with inappropriate fetal growth either in the form of IUGR or large for dates babies. IUGR is usually defined as birth weight below the 10th percentile for the gestational age. However neonates of the same gestational age and the same external body dimensions differ by as much as 30 to 40 percent in their birth weights. Ponderal index describes the relationship between weight and length of a neonate and hence has been found to be more sensitive in detecting growth abnormalities than weight centiles alone. Neonatalogists have utilised Rohrer's ponderal index which is the ratio of the B. wt. in gms upon crown heel length 3x100, to assess the nutritional status of the neonate. With the advent of high resolution dynamic ultrasound it is possible for the obstetricians to calculate the intrauterine ponderal index (IUPI) to assess fetal nutritional status. This study was undertaken to find out the value of IUPI in the prediction of IUGR in high risk pregnancies and to correlate this with perinatal outcome.

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MATERIAL AND METHODS

Patients with singleton pregnancies between 28-30 wks and with known last menstrual period, were enrolled from the antenatal clinics and maternity wards of Smt. Sucheta Kriplani hospital in 1991-92. These were divided into 2 groups.

Group I (Study group) consisted of 30 high risk patients.

Group II (Control group) comprised of 30 patients with uncomplicated pregnancies.

Criteria taken for high risk pregnancy were

1. Pregnancy complicated by PIH, essential hypertension or by renal disease.
2. Previous H/O unexplained stillbirths, neonatal deaths or BOH
3. Previous H/O small for date or large for date babies.

Patients with multiple pregnancies, intrauterine fetal death, congenital malformation of the fetus, premature rupture of membranes, antepartum haemorrhage or with uncertain dates were excluded from the study.

Clinical details recorded included present and past obstetric history, family history, general physical and obstetric examination. Investigations done at admission were haemoglobin, blood group and Rh, urine for albumin, sugar and microscopic examination, kidney function test,

fundus examination and other tests like blood sugar as and when required.

An initial U/S was done by real time 3.5MHZ linear - array transducer. Fetal parameters recorded were biparietal diameter, head circumference, abdominal circumference & femur length. From these fetal weight was calculated by Shepard's et al (1982) formula and fetal length was calculated by Vintzelious formula (1986).

IUPI was calculated as 1986.

Fetal weight in gms/fetal length in cms3 x 100.

Patients in both the groups were followed fortnightly till 36 wks and weekly thereafter till delivery. Fetal growth was monitored by symphysio-fundal height and ultra sound biometrics were done at 3 wks interval till 36 wks and weekly thereafter. Patients were asked to keep daily fetal movement count record and biophysical scoring was done if required. Antepartum complications were recorded. Labour events, mode of delivery and evidence of intrapartum fetal distress were noted. Neonatal Apgar score was recorded, birth weight taken and gestational age assessed and corroborated with modified Dubowitz scoring. Neonatal Ponderal Index was calculated from the birth weight and crown heel length of the neonate. It was screened for hypoglycemia using dextrostix. Any neonatal death, neonatal hypothermia, hyperbilirubineamia or any other complication requiring admission to intensive care unit was recorded.

OBSERVATIONS

Maternal demographic characteristics were evenly matched in both groups. To calculate the centile curves of IUPI, norms established on Indian population by Chellani et al (1990) & Man Mohan et al (1990), were used.

It was found that in group II i.e. control group all the 30 patient had normal IUPI i.e. between the tenth and ninetieth percentile. On the other hand, 22 pts in group I i.e. study group had normal IUPI whereas 7 pts had their fetal ponderal index below the 10th percentile and 1 pt had her fetal ponderal index above the 90th percentile (Table I). When the neonatal

TABLE I
IUPI PERCENTILE DISTRIBUTION

Percentile	Study GP		Control GP	
	No	%	No	%
<10th percentile	7	23.3	-	-
10-90th percentile	22	73.4	30	100
> 90th percentile	1	3.3	-	-

TABLE II
PERCENTILE DISTRIBUTION OF NEONATAL PI in GIP & II

Neonatal PI	Group I		Group II	
	No	%	No	%
<10th percentile	11	36.7	-	-
10-90th percentile	18	60.0	30	100
> 90th percentile	1	3.3	-	-
Total	30	100	30	100

TABLE III
PROGNOSTIC EFFICACY OF IUPI IN DETECTION OF IUGR IN STUDY GROUP

Fetal PI	Neonatal PI	
	<10th percentile	>10 percentile
<10th percentile	6	1
>10th percentile	5	18

Sensitivity = 54.5% Specificity = 95%
Positive Predictive value = 85.7%
Negative predictive value = 78.2%

ponderal index was calculated it was found that all 30 neonates in group II had normal neonatal ponderal index. In group I, however 11 neonates were found to have their ponderal indices below the 10th percentile (Table II). When the fetal ponderal index was correlated with the neonatal ponderal index it was found that of the 11 neonates with low ponderal index, 6 had their fetal ponderal index also below the 10th percentile and were diagnosed in the antenatal period. One neonate whose fetal ponderal index was predicted to be low was found to have normal ponderal index at birth. Thus the efficacy of intrauterine ponderal index to predict IUGR was found to have a sensitivity of 54.5%, specificity of 95%, positive predictive value of 85.7%

TABLE IV
DEPICTS PERINATAL OUTCOME IN RELATION TO INTRAUTERINE PONDERAL INDEX IN GP - I.

		Antepartum fetal well being				Labour outcome		Neonatal outcome									
INTRA-UTERINE P.I.	Symph-ysis fundal ht growth cm/week	BPS < 6 distress		I.U.D		Intrapar-tum fetal	Delivery by CS./ forceps	5 min Apgar Score < 7	SGA	Abnor-mal Neonatal P.I.		Hypogl-ycemia	Jaun-dice	Aspir-ation pneum-onia	Septice mia	Neon-atal death	
		No.	%	No.	%	No	%	No. %	No. %	No	%	No. %	No. %	No. %	No. %	No. %	
Normal N=22	0.68	3	13.6	0	0	6	27.2	3 13.6	4 18.1	4	18.1	5 22.7	3 18.12	9.01	1 4.5	1 4.5	0 0
Abnormal* (<10th percentile) n=7	0.40	2	.28.5	1	14 2	3	42.8	1 14 2	4 57.1	6	85.7	6 85 7	4 57.12	28.5	4 57.1	0 0	0 0
P value		0.34 NS		0.24 NS		0.59 NS		0.69 NS	0.045 S	0.002 S		.005 S	0.033 S	0.28 NS	.006 S	-	-

NS = Not significant

S = Significant

* One fetus had P I. above ninetieth percentile.

and negative predictive value of 78.2% (Table III). When the perinatal outcome was correlated with IUPI it was found that in group II there was no significant perinatal mortality or morbidity as all patients had normal IUPI. In group I, however two sub-groups were observed, one was of patients whose IUPI was normal and another whose IUPI was abnormal. The subgroup with normal IUPI, had symphysio-fundal height growth of 0.68 cms per wk as against 0.40cm/wk in patients with low IUPI, in the antenatal period. A higher incidence of low bio-physical score <6 was observed in patients with low IUPI viz. 28.5% as against 13.6% in patients with normal IUPI. In group I, there was one intra-uterine death in abnormal as against none in normal IUPI subgroups. The above results however were not statistically significant. (Table IV). Similarly when labor outcome was compared in the two sub-groups of group I, it was observed that although intrapartum fetal distress and instrumental delivery rate was higher in patients with abnormal IUPI the results were not statistically significant. (Table IV).

When neonatal outcome was compared in the two sub-groups, of group I, it was found that Apgar score <7 was significantly higher in the patients with abnormal IUPI being 57.1% as against 18.1% in those with normal IUPI. Besides there was highly significant difference in the incidence of SGA & neonates with low neonatal PI in the two subgroups. Complications like neonatal hypoglycemia and aspiration pneumonia were significantly higher in neonates with low IUPI (Table IV).

DISCUSSION

Assessment of altered intra-uterine fetal growth is the commonet problem encountered by the obstetrician in day to day practice. Its early recognition is the best way to prevent perinatal mortality and morbidity. Percentile growth curves relating birth weight with gestational age has been the standard basis for quantitating intrauterine growth. In the present study, however, intrauterine ponderal index (IUPI) was used to assess intra-uterine growth and an attempt was made to determine its value in predicting IUGR in high risk pregnancies. The sensitivity and specificity of IUPI in predicting IUGR was found to be 54.5% and 95% respectively while its positive and negative values were 85.7% and 78.2% respectively. Although several workers have done similar study, the population studied by them was either unselected or low risk hence their results could not be compared (Table V). Vintziileous et al (1986) studied similar population group to that of the present study. They found the sensitivity of IUPI to predict IUGR as 76.9% which was higher than 54% in the present study but their positive predictive value was lower being 35.7% as against 85.7% in the present study (Table V). The high positive predictive value and specificity of IUPI to detect IUGR is highly desirable as it selects those patients who require extensive

TABLE V
COMPARISION OF PROGNOSTIC EFFICACY OF IUPI TO DETECT IUGR IN DIFFERENT STUDIES

Author	Population studied	Sensitivity	Specificity	Predictive Value positive	Value negative
Vintzileous et al (1986)	HR pts. with medical complications of pregnancy.	76.9%	82.0%	35.7%	94.4%
Yagel et al (1987)	Unselected population	91.6%	74.3%	52.4%	96.7%
Brown et al (1987)	——do——	55.0%	71.0%	18.0%	92.0%
Sarmandal et al (1990)	——do——	52.0%	77.0%	20.0%	
Chellani et al (1990)	Low risk population	56.7%	84.6%	53.8%	96.7%
Present study	HR population	54.5%	95.0%	85.7%	78.2%

antepartum and intrapartum monitoring which is expensive and time consuming and cannot be performed on all patients.

Perinatal outcome was correlated with IUPI in both groups. In group II i.e. control there was no perinatal mortality or morbidity and all the patients had normal IUPI. In group I i.e. the study group, two subgroups were identified, 8 patients had abnormal IUPI of which 7 had low IUPI and one had high IUPI and 22 patients had normal IUPI. In this group, antenatal and intranatal complications like low symphysio-fundal height growth, intrauterine death, low biophysical score (<6), intrapartum fetal distress, delivery by LSCS or forceps were higher in subgroup with low IUPI than in subgroup with normal IUPI. These results however, were not statistically significant. On the other hand when neonatal complications were compared in the patients of the study group it was found that subgroup with low IUPI had a much higher incidence of all neonatal complications than the subgroup with normal IUPI. These difference were highly significant statistically. This shows that although the neonatal complications were significantly higher in patients with low IUPI, the same were not picked up in the antenatal or intrapartum period. This may have been due to

the fact that the results of IUPI were not revealed to the managing obstetrician and no interference was done on the basis of its findings. In the present study, the patients were monitored in the antenatal period by DFMR, NST & BPS and in the intrapartum period by clinical monitoring i.e. by auscultaion of the fetal heart. This shows that this level of antepartum and intra-partum care while adequate for patients with normal IUPI, was inadequate for patients with low IUPI. To detect the fetus at risk in patients with low IUPI, more extensive fetal monitoring is essential. Thus more frequent BPS, oxytocin challenge test, doppler blood flow studies of the fetal blood vessels, continuous intrapartum fetal monitoring and fetal scalp blood pH which were not done in this study, should have been done and may have helped to identify and treat compromised fetuses. Besides further research should be directed towards those methods of detecting fetal compromise which are likely to preceed the anthropometric alterations in the fetus. This would go a long way in helping the obstetrician to plan and modify patient management and minimise perinatal complications.

CONCLUSION

Although intrauterine ponderal index has s sensitivity of only 54.5% in predicting IUGR, a high specificity and positive predictive value helps in identifying patients whose fetuses need extensive monitoring to avoid various perinatal complications. Detection of normal IUPI in the fetus of patient assures the attending obstetrician on normal perinatal outcome and routine antenatal care is adequate for such fetusses. On the other hand presence of low IUPI in the fetus should alert the managing obstetrician to the need of extensive, frequent and advanced antepartum and intrapartum fetal monitoring and timely intervention . The neonatalogist also hould be forwarned about the possible complications and timely help sought.

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